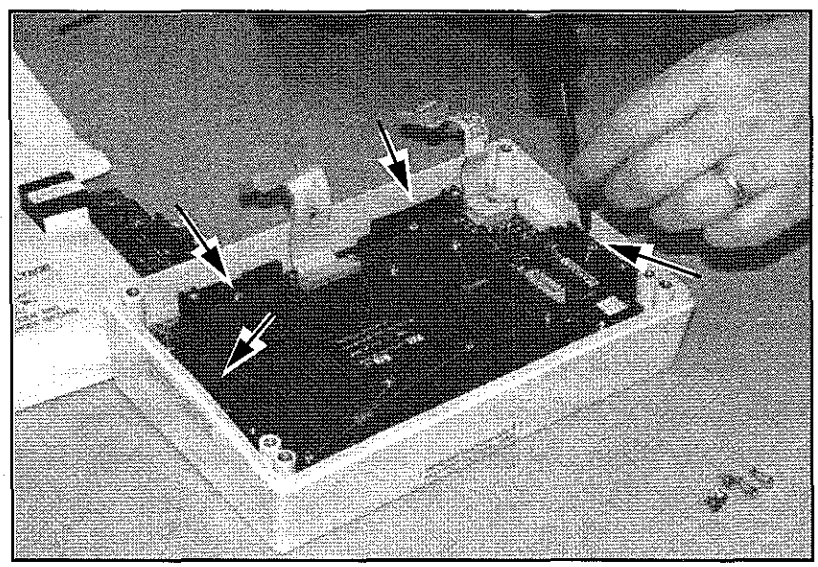
Replacing the Digital Board

If a problem occurs with the Digital board, return the entire monitor to Protocol for service. See Section 1 for information on Technical Service.

Do not remove the PROM from the Digital board.

The Digital board is secured beneath the Analog board by four screws and one hex post. The four screws are located in the black brackets, the hex post is located in the lower right corner of the board.

1. Remove the battery pack according to the procedures on page 5-7.
2. Open the monitor according to the procedure described in on page 5-11.
3. Remove the Analog board according to the procedure on page 5-16.
4. Remove the four screws fastening the Digital board to the front chassis.

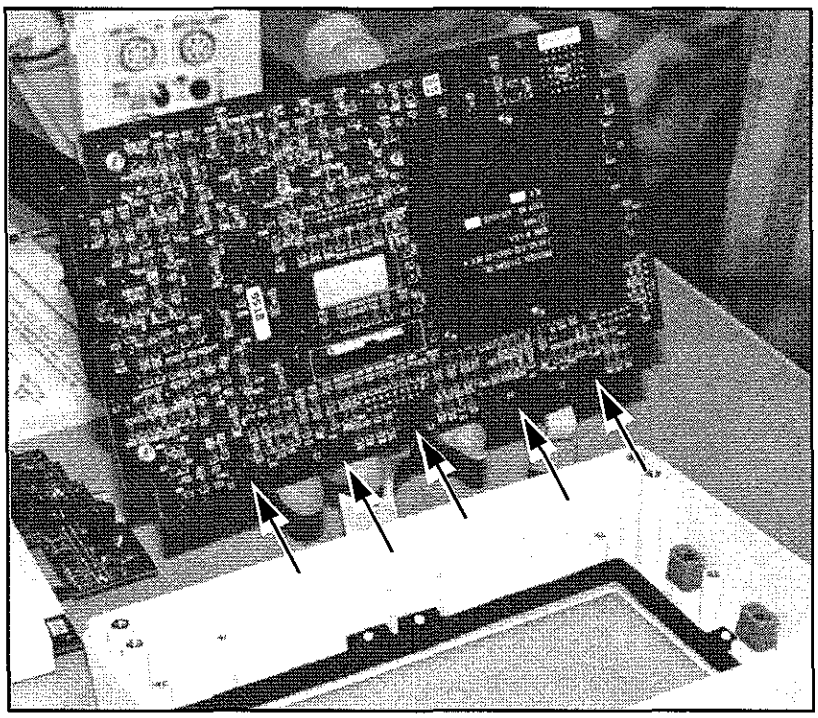


5. Use the nut driver to loosen and remove the hex post.
6. Lift the Digital board up and out of the front chassis.

The Digital board is connected to the EL display module by connector J1. This connector should detach easily.

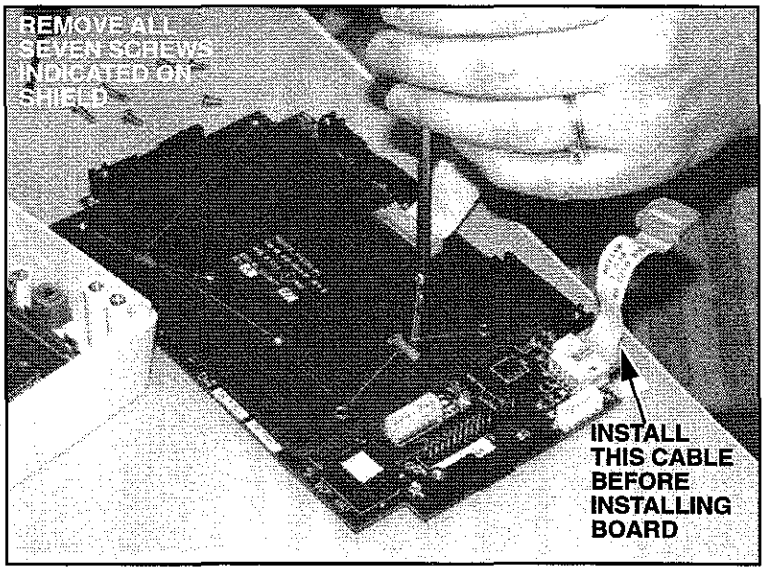
7. Remove the 10-pin ribbon cable (cable from the Digital board to the Recharger board).

Do not touch the button contact surfaces on the underside of the Digital board. These surfaces must remain clean and oil-free. If you touch them, clean them with a cotton swab moistened with isopropyl alcohol.

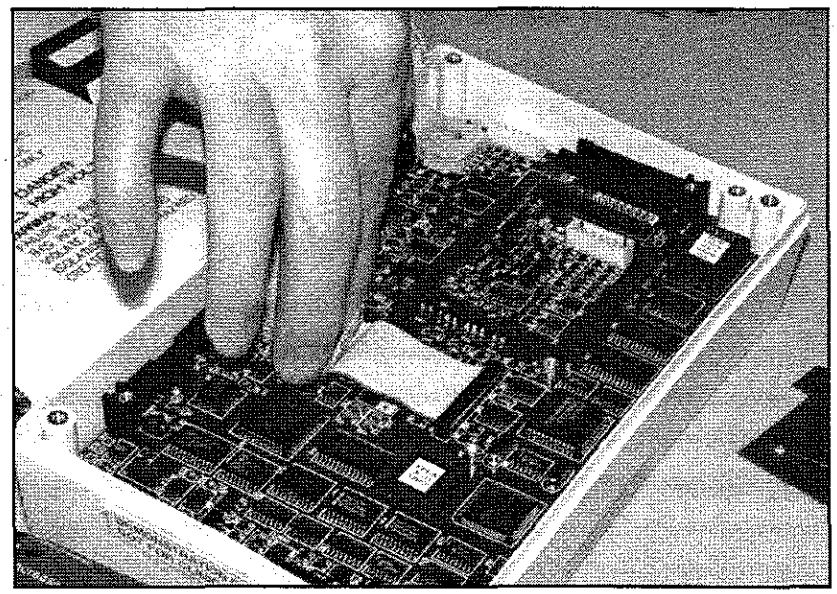


When installing the Digital board:

- Make sure the cable between the Digital board and the Recharger board is installed on the Digital board before placing the board in the front chassis (see figure on page 5-20).
- Remove the shield on the top of the Digital board in order to reconnect the display cable (see figure on page 5-20).



- Blow out any dust and particulates from the board using pressurized de-ionized gas before installing it.
- Connect the display cable to the Display module.



- Replace the shield, noting the correct screw lengths indicated on the shield. When replacing the insulating shield, make sure the left side of the shield is placed underneath the top surface of the bracket.
- Torque all screws and the hex post to 3.8 in-lb to 4.0 in-lb (.43 N-m to .47 N-m).

Replacing the EL Display Module

Removing the EL display module may damage the electrically-conductive inner surface of the display filter. Protocol recommends leaving the display unit in the front chassis unless you replace the display unit and the front chassis together.

The conductive silicone gasket between the display module and display filter may remove the delicate coating from the perimeter of the filter if the gasket peels up as the display module is removed. If electrical contact with the filter is degraded sufficiently, the display's EMI may interfere with ECG and/or SpO_2 monitoring if patient cables pass near the display.

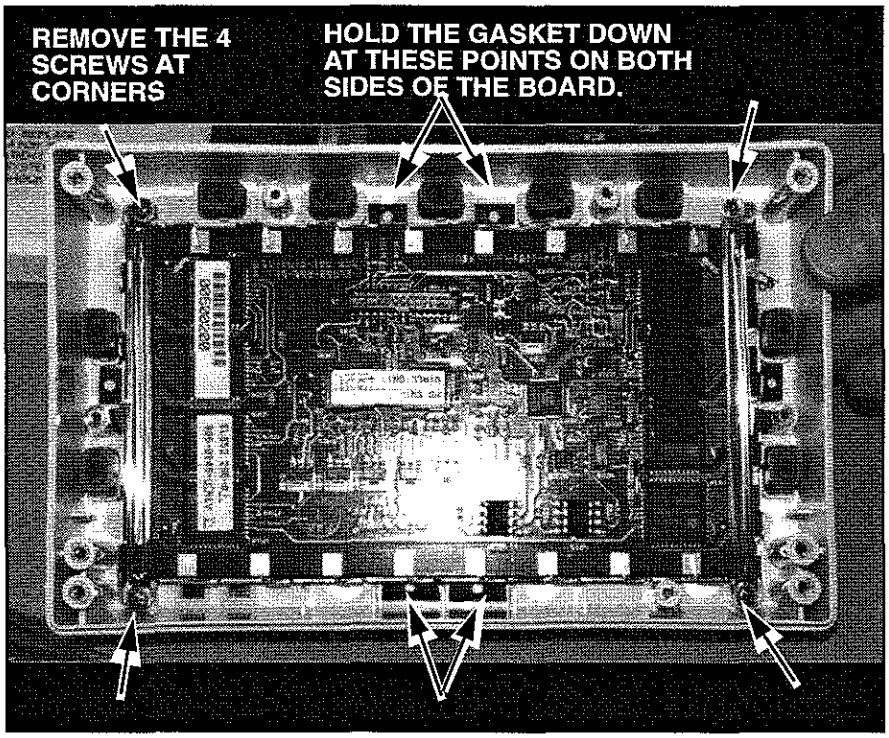
If you must remove the display module, use two people in the removal procedure to attempt to minimize damage to the display filter.

This section provides instructions on how to replace the display module. The display module is attached to the front chassis beneath the Analog and Digital boards by two brackets, each fastened at the top and bottom by a screw and two washers.

Note the voltage indicated on the label of the display module. This value is used for calibrating the display high voltage supply on the Recharger board.

1. Remove the battery pack according to the procedures on page 5-7.
2. Open the monitor according to the procedure on page 5-11.
3. Remove the Analog board according to the procedure on page 5-16.
4. Remove the Digital board according to the procedure on page 5-18.
5. Remove the screws and washers holding the brackets on the left and right sides of the board.

Handle these brackets carefully. They are constructed of very thin metal. Their purpose is for conductivity, not to secure the display.



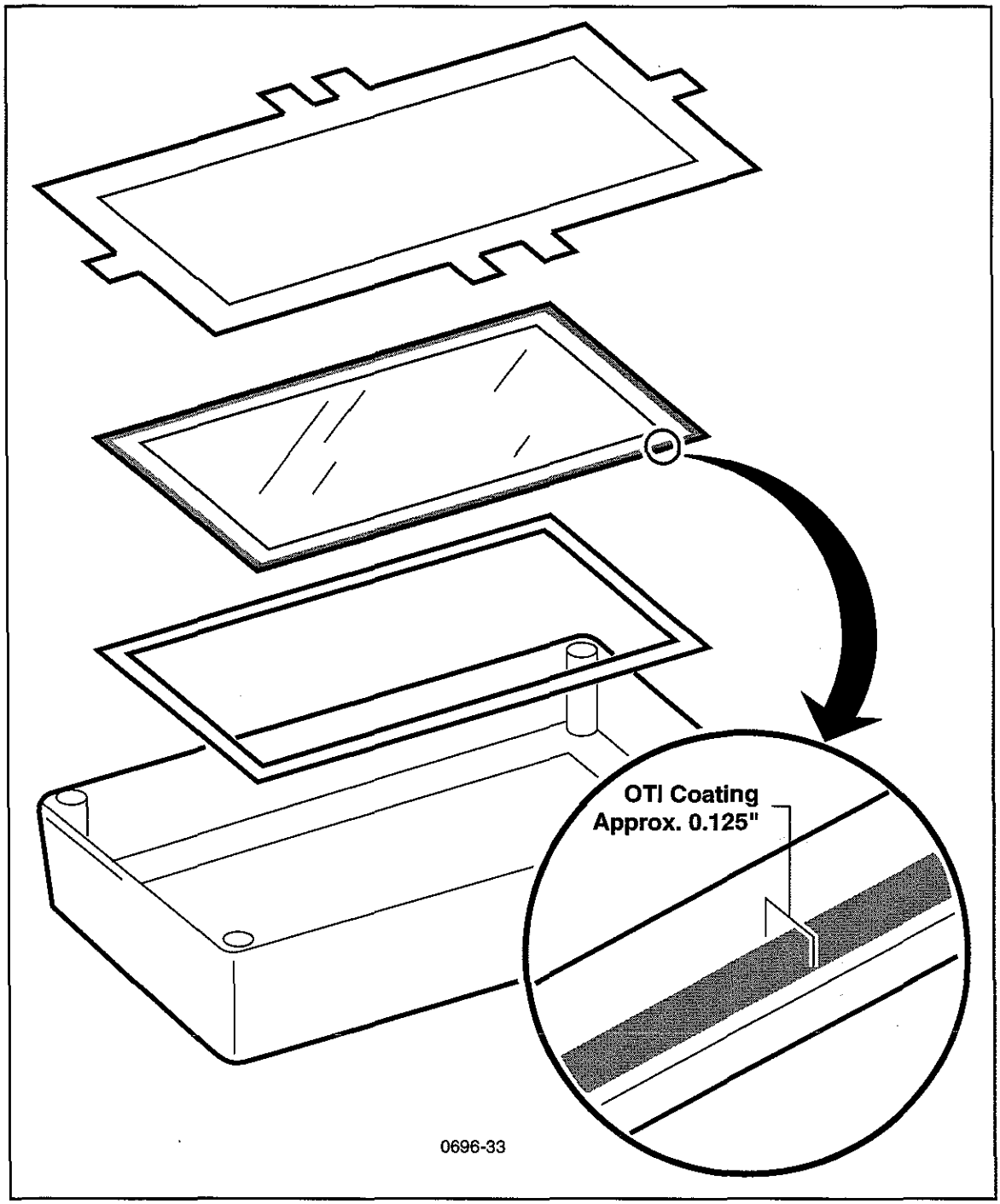
CAUTION

In the next step, if the gasket lifts off the display filter at any point, you must inspect the display filter to verify that the conductive coating on the filter is still intact. See the steps below.

6. To carefully remove the display:

   - Using a flat blade screwdriver, each person should hold the silicone gasket down where it is visible between the posts at the top and bottom of the chassis (see figure above).
   - With their free hand, each person should gently lift one side of the display module, attempting to keep the silicone gasket in place on the display filter.

If the gasket lifts off the display filter at any time, inspect the filter beneath the section where the gasket lifted to ensure the conductive coating around the perimeter of the filter is still intact. Try not to disturb the rest of the gasket/filter interface as you do this. To inspect the filter, look for a slight color variation between the perimeter conductive coating and the rest of the filter (see figure on page 5-23). (Tilting the front assembly at different angles under a bright light can help you see the color variation of the conductive coating.) The slight color variation should be continuous around the perimeter under the gasket. If there is a break in this coating, you must replace the front assembly with the display filter.


OTI Coating
Approx. 0.125"
0696-33

When installing the display module:

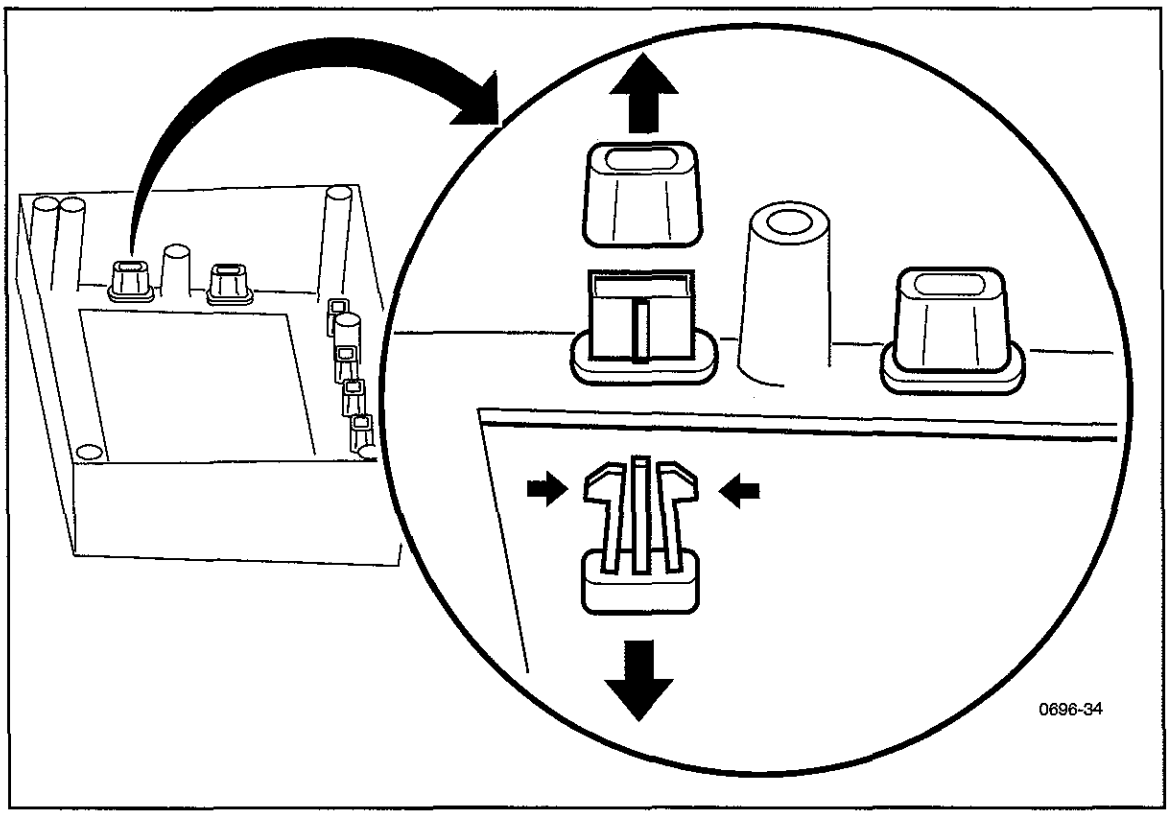
- Remove any dust from the display filter using pressurized de-ionized gas.
- Orient the display module so that the J1 connector is toward the buttons.
- Orient the brackets so that the holes on the bracket straps align with the holes in the posts on the sides of the chassis.
- Verify two washers are present for each screw.
- Torque screws to 3.8 in-lbs to 4.2 in-lbs (.43 N-m to .47 N-m).
- After the display is in place, blow out any particulate with de-ionized gas.

Removing Front Panel Buttons

This section describes how to remove the front panel buttons.

You do not need to remove the display module to service the front panel buttons. Buttons can be replaced while the display module remains in the front chassis.

1. Remove the battery pack according to the procedures on page 5-7.
2. Open the monitor according to the procedure on page 5-11.
3. Remove the Analog board according to the procedure on page 5-16.
4. Remove the Digital board according to the procedure on page 5-18.
5. Grasp the Silastic™ gray dome and pull the dome off the button post (see figure on page 5-25).
6. Squeeze the plastic button latches together and then push the button out the front of the panel (see figure on page 5-25).



note...

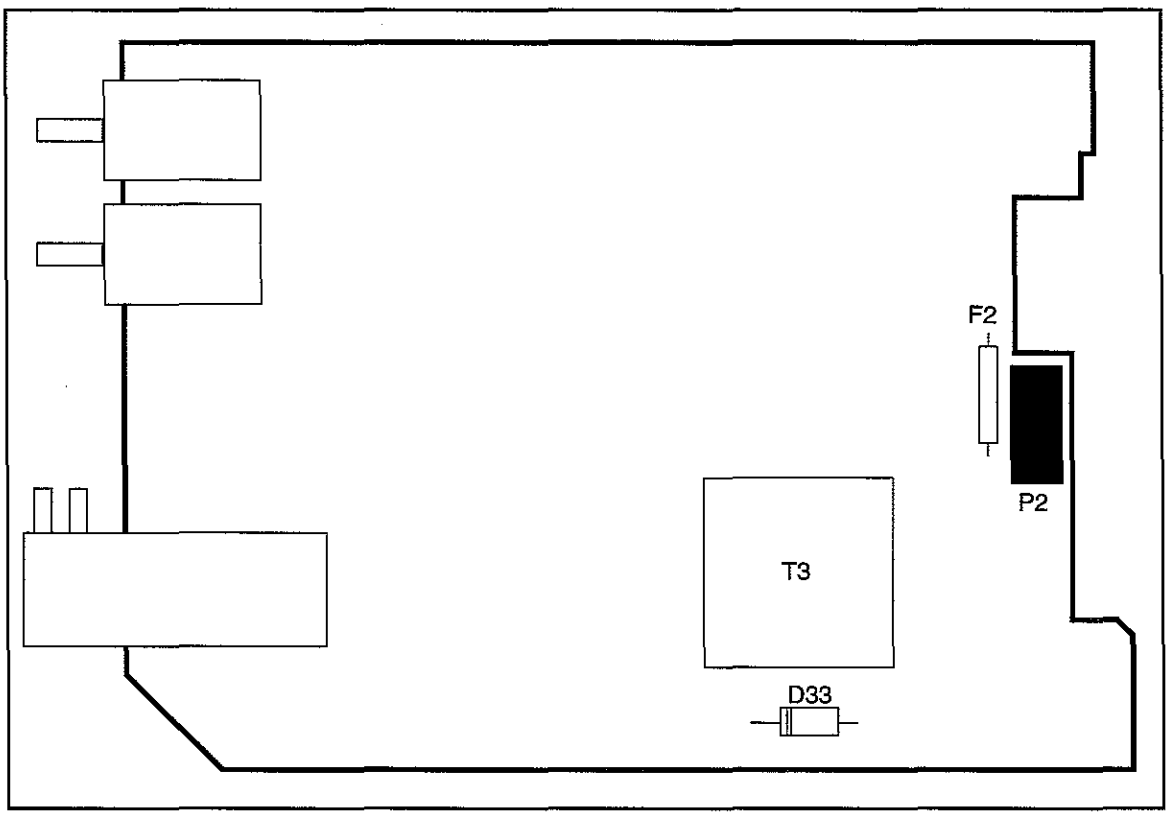
The button dome can be replaced on the post without regard to the orientation of the notch engraved in the dome.

Replacing Recharger Board Fuse (F2)

The Recharger board fuse (F2) protects the monitor power supply input at the battery line to the monitor. If the monitor does not turn on but the BATTERY CHARGING indicator lights when the ac power adapter is connected, check fuse F2 (3 Amp).

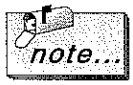
The fuse is heat sensitive and must be soldered with heat sinks in place between the fuse body and the solder joint.

1. Remove the battery pack according to the procedures on page 5-7.
2. Open the monitor according to the procedure on page 5-11.
3. Remove the Recharger board according to the procedure on page 5-30.
4. Replace the fuse (F2, location is shown in the figure below).

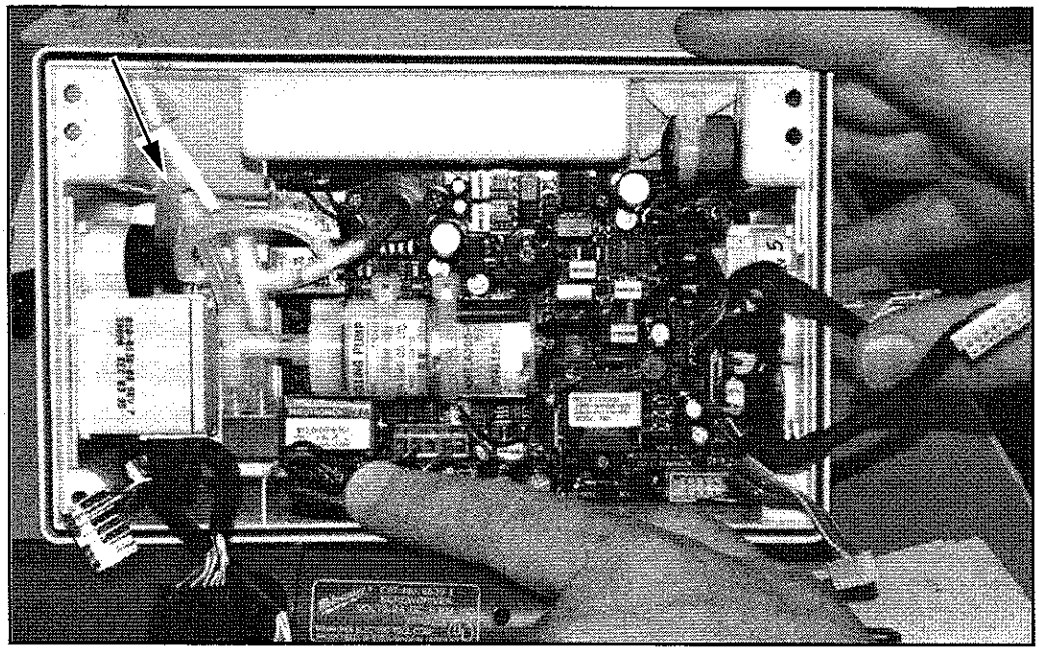


Replacing Air Tubing

Replace the NIBP tubing as a single assembly to ensure the tubing lengths are accurate. Refer to Section 7 for the tubing assembly part number.



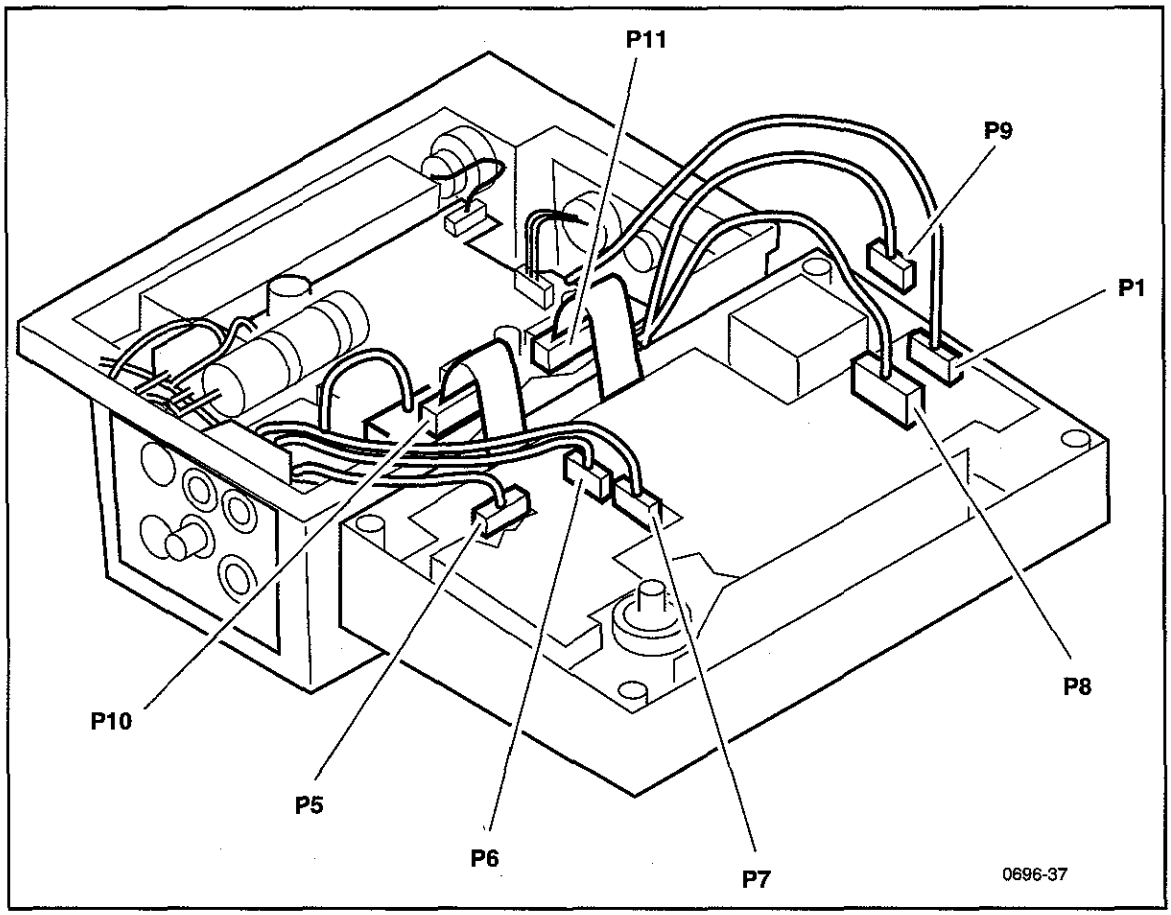
If you don't need to replace the length of tubing between the cuff hose connector in the left side panel and the rest of the tubing assembly, don't remove the left side panel to disconnect this tube. Leave that length of tubing connected to the side panel but disconnect it from the rest of tubing assembly as indicated by the arrow in the figure below, and replace the tubing assembly.



Replacing Cables

If you suspect a cable to be faulty, check its continuity on all pins. If you need to replace a cable, refer to Section 7 for part numbers. See the figure on page 5-28 for cable locations.

When removing a cable, be sure to note the routing. It is important that the new cable is routed in the same manner.



Replacing PROMs

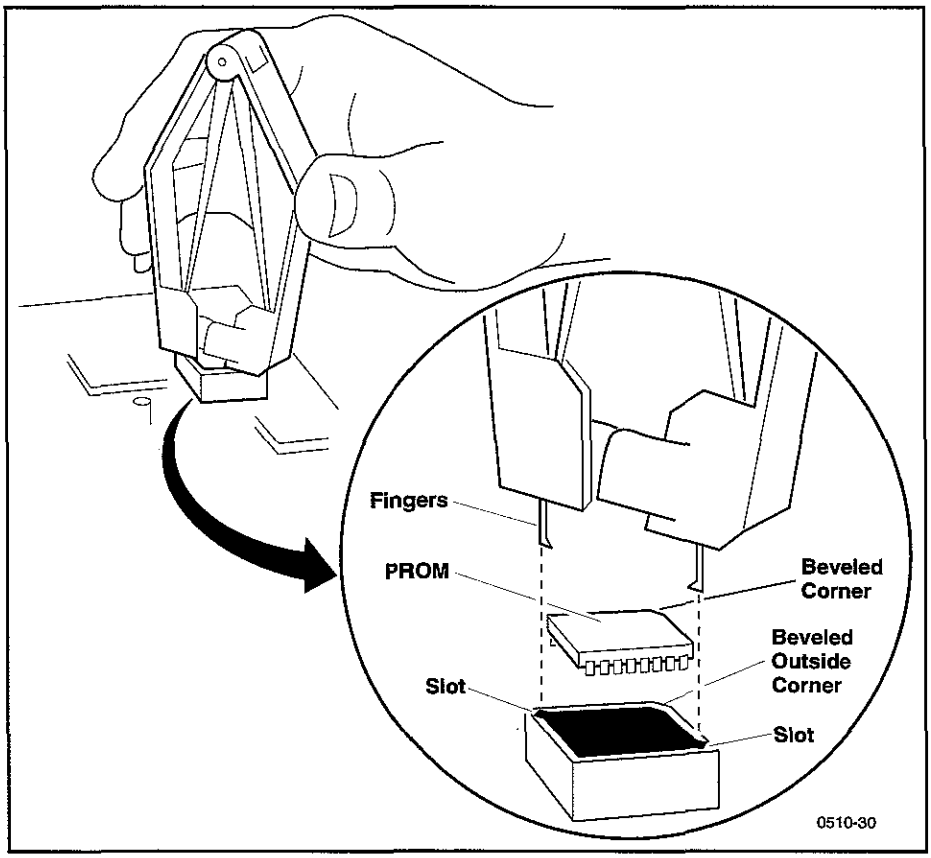
Please read the information in **Propaq Encore Software** on page 5-1.

The PROMs require a special removal tool to replace them. See the Required Tools list on page 5-2.

The PROMs can be damaged by static discharge. Work only at a static-protected work station.

Do not remove the PROMs from the Analog and Digital board. The following instructions describe how to replace all other PROMs:

- To remove the PROMs, insert the fingers of the PROM removal tool into the slots at two corners of the PROM and firmly squeeze the tool handles to pop out the PROM.
- To load the new PROM, align the beveled corner of the PROM with beveled OUTSIDE corner of the socket. Carefully press the new PROM into place.



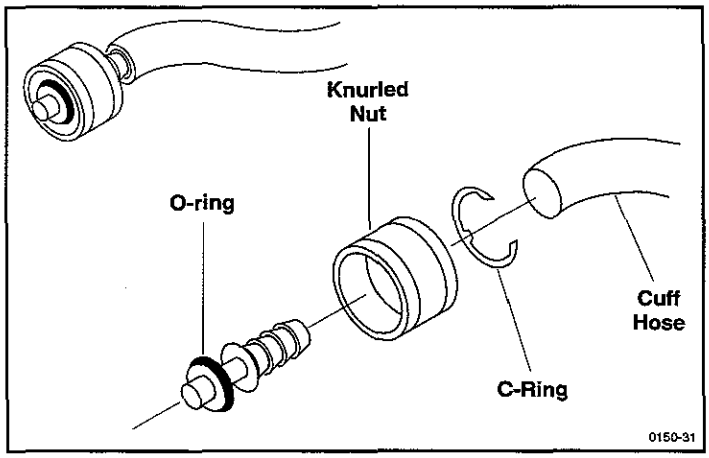
Cuff Fittings

Air system integrity in the NIBP system is essential to ensure accurate measurements. Routine wear of the O-ring gasket located in the threaded fitting of the cuff hose can result in air leaks. If you encounter air leaks that can not be found from the tests in this manual, replace the O-ring first.

WARNING

Use of NIBP channel with leaking cuff hose fittings may result in inaccurate non-invasive blood pressure measurements.

1. Disconnect the cuff hose from the monitor.

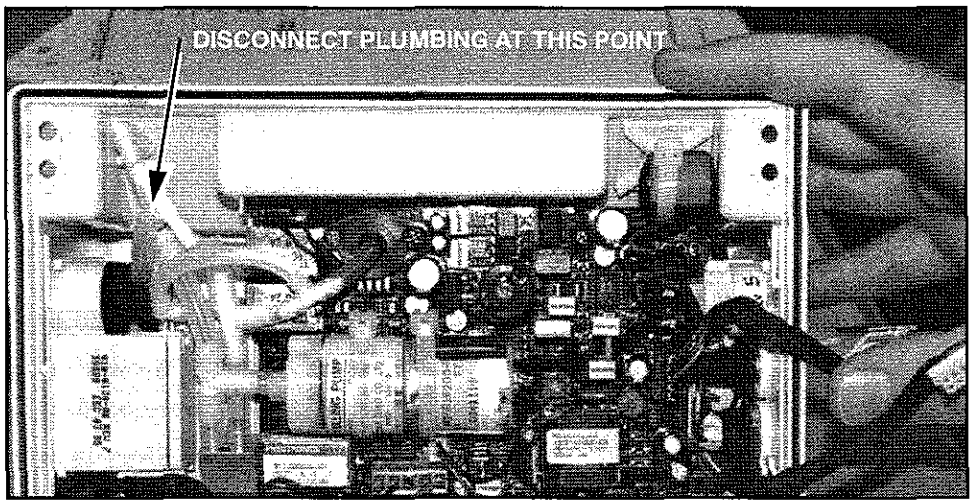


2. Using pliers, pull off the metal fitting from the cuff hose.
3. Cut approximately 1/2" off the cuff hose.
4. Using a small screwdriver, remove the C-clip from the fitting.
5. Remove the knurled nut from the fitting.
6. Remove the O-ring gasket and replace it with a new one, being careful not to nick or otherwise damage the new O-ring.
7. Reassemble the fitting with the knurled nut and C-clip.
8. Press the fitting back onto the cuff hose.

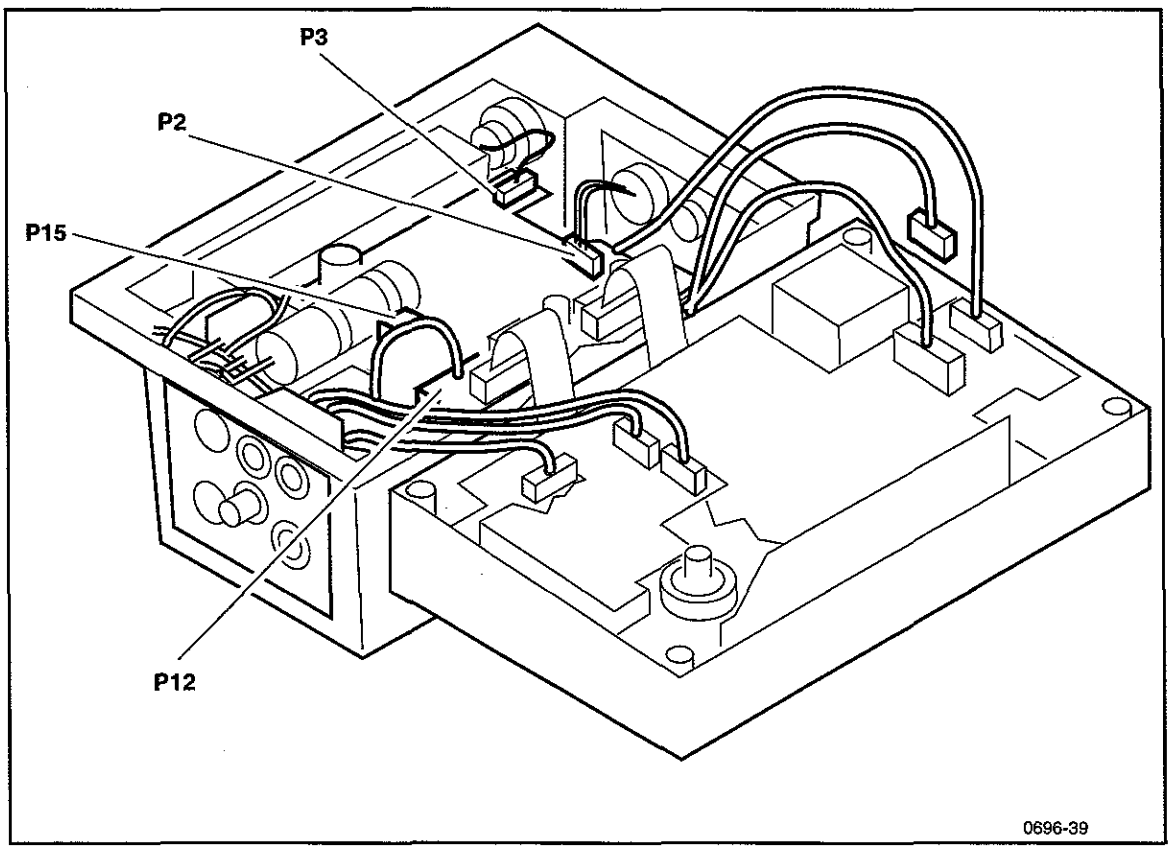
Replacing the Recharger Board

The Recharger board is secured to the rear chassis by four screws. When removing the Recharger board, note the location of cables, plumbing, and screws and screw lengths.

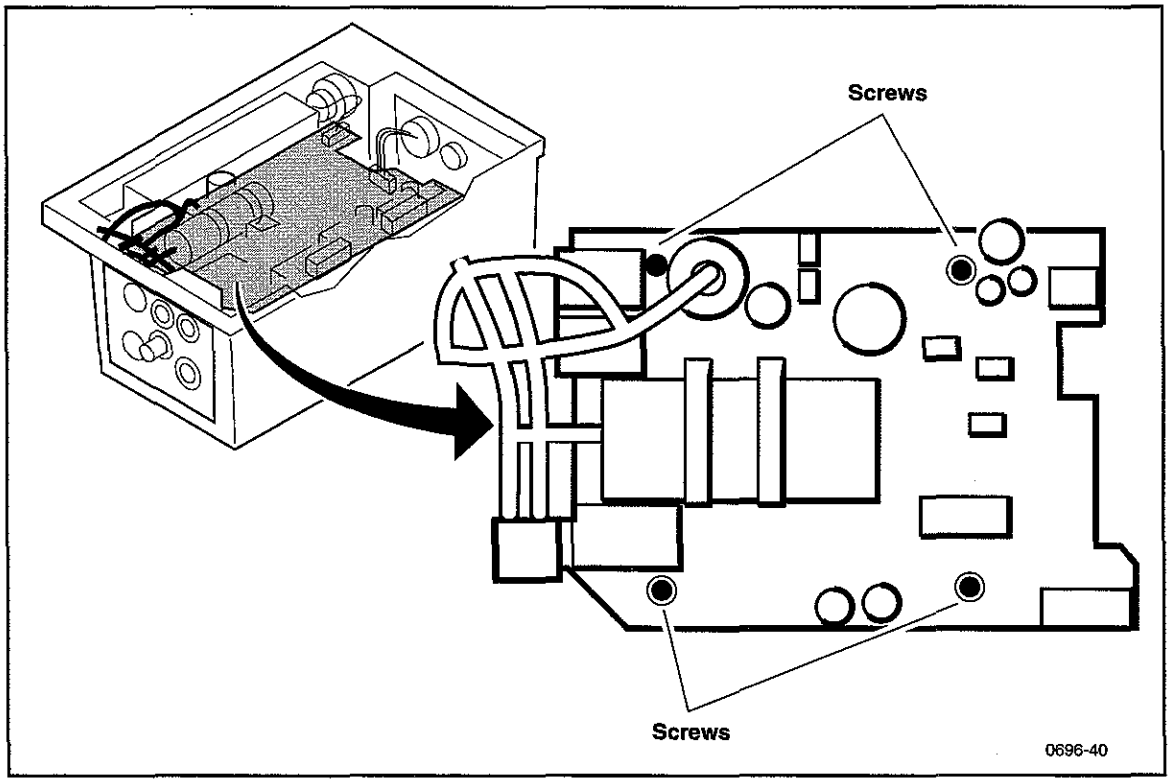
1. Remove the battery pack according to the procedures on page 5-7.
2. Open the monitor according to the procedure on page 5-11.
3. Disconnect the air tubing attached to the valves and pump at the junction indicated in the figure on on page 5-31.



4. Disconnect cables P2, P3, P12, and P14 from the Recharger board. Note cable routing for reinstallation.



5. Remove the four screws securing the Recharger board to the rear chassis. Note the screw passing through the pressure transducer is longer than the three that pass through the board only.



6. Lift out the Recharger board.

As you set the board in place during installation, keep the board clear of the power switch solder terminals to avoid binding against them. The terminals may become damaged if force is applied against them.

When installing the Recharger board:

- blow out any dust and particulate using pressurized de-ionized gas
- move all cables out of the way
- torque screws to 3.8 in-lbs to 4.2 in-lbs (.43 N-m to .47 N-m)

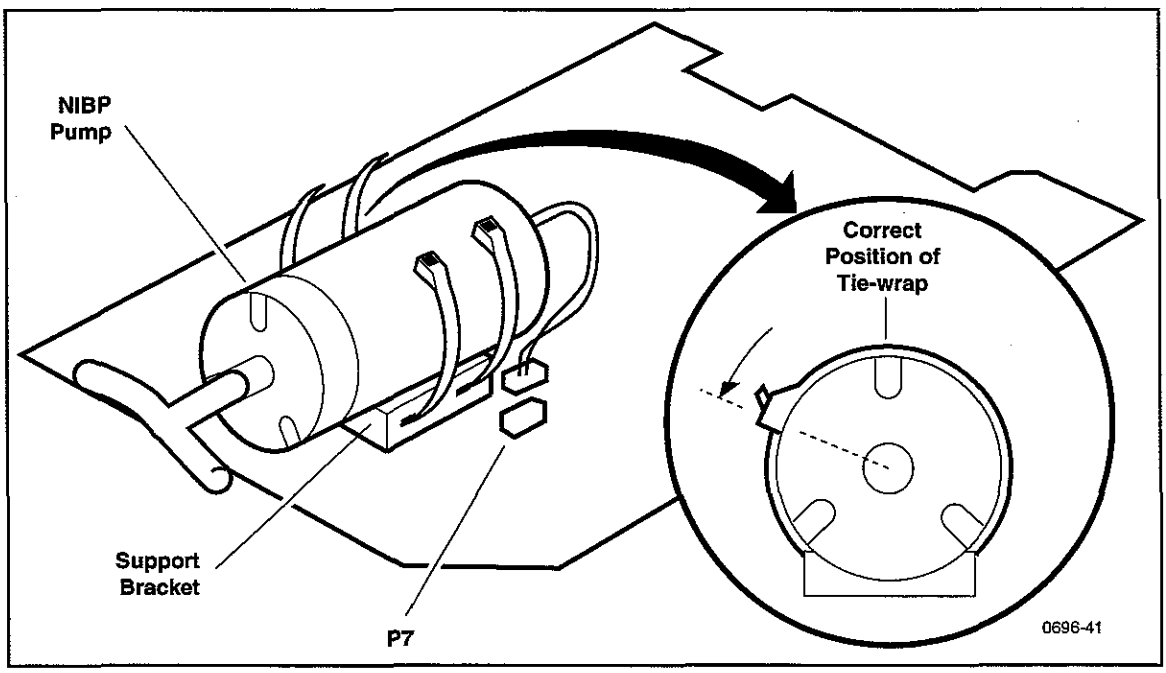
Replacing the Pump

New wires and a connector are provided with the replacement pump kit.

1. Remove the battery pack according to the procedures on page 5-7.
2. Open the monitor according to the procedure on page 5-11.
3. Remove the Recharger board according to the procedure on page 5-30.
4. Unplug the pump cable from the Recharger board.
5. Disconnect the tubing from the pump.
6. Cut the tie wraps securing the pump to the Recharger board.
7. Lift the pump from the board, and remove the old tie wraps from the support brackets.

When installing a pump:

- Slide new tie wraps into support brackets as shown in the figure below.
- Set the pump onto the Recharger board.
- Secure the pump to the Recharger board with tie wraps, aligning the fastener ends as shown in the figure below and cutting off the excess.
- Plug in the pump cable to connector P7 on the Recharger board.



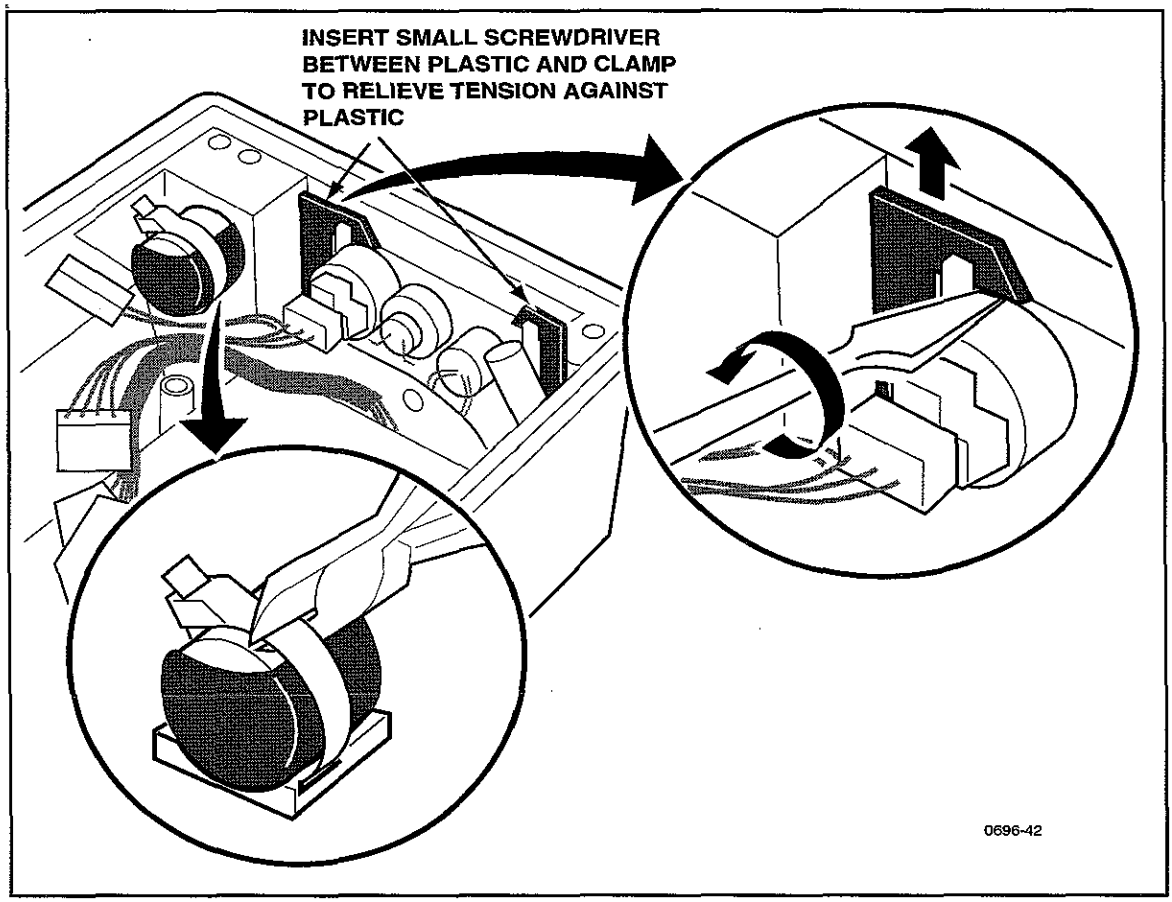
Replacing the Side Panels

The Propaq Encore side panels are complete assemblies.

The side panels are sealed to the rear chassis with an adhesive gasket. A new gasket is provided with the new side panel kit.

Removing the Right Side Panel

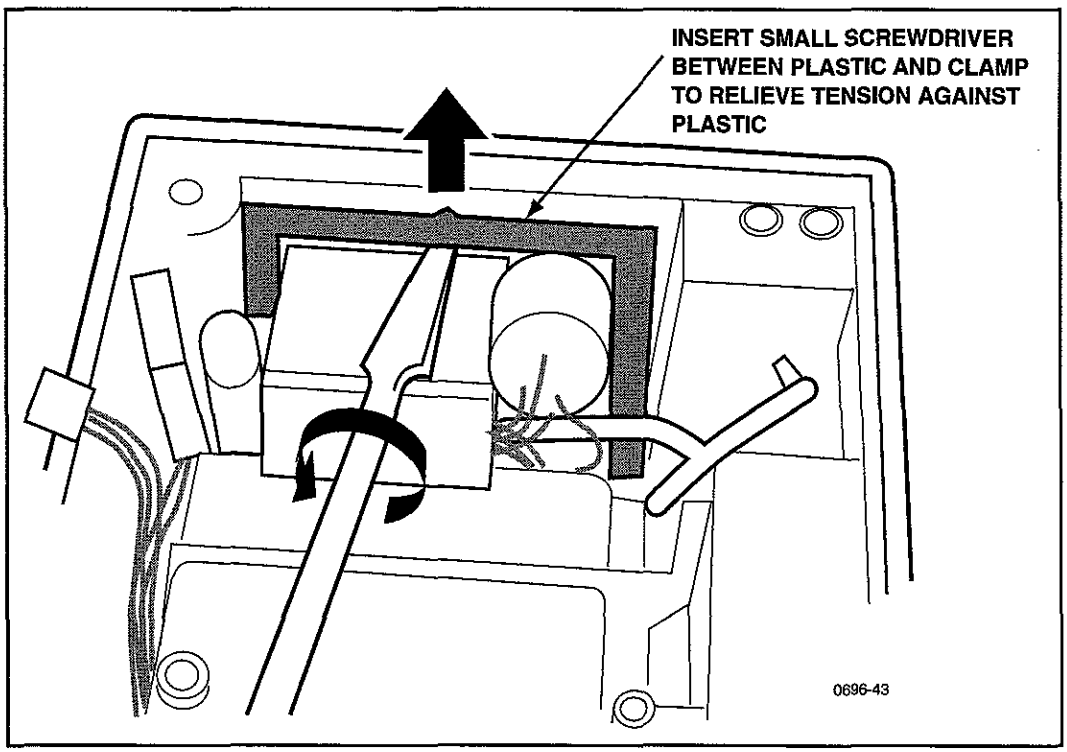
1. Remove the battery pack according to the procedures on page 5-7.
2. Open the monitor according to the procedure on page 5-11.
3. Remove the Recharger board according to the procedure on page 5-30.
4. Cut and remove the tie wrap securing the bead connected to the side panel.



6. Remove the two right side panel clamps by inserting the end of the flat blade screwdriver under the clamp and gently rotating the blade to loosen the clamp. Then slide the clamp out.
7. Press the side panel out of the rear chassis. There is an adhesive gasket around the side panel which requires considerable force to separate. **Do not pry against components.**

Removing the Left Side Panel

1. Remove the battery pack according to the procedures on page 5-7.
2. Open the monitor according to the procedure on page 5-11.
3. Remove the Recharger board according to the procedure on page 5-30.
4. Remove the U-shaped clamp that secures the left side panel assembly by inserting a small screwdriver between the clamp and plastic and the end of another flat blade screwdriver under the clamp and gently rotating the blade to loosen the clamp. Then slide the clamp out.



5. Press the side panel out of the rear chassis. There is an adhesive gasket around the side panel which requires considerable force to separate. **Do not pry against components.**
6. Remove the tubing attached to the cuff hose connector. You can reuse this tubing when installing the new side panel.

Installing Side Panels

1. Clean all gasket material from the rear chassis where the side panel is to be installed. (The adhesive side of duct tape can be used to pull away old gasket residue.)
2. Attach the tubing to the NIBP cuff hose connector.
3. Route the bundle of cabling with the bead under the temperature connector housing so that when the side panel is installed the connectors will extend out of the rear chassis along the bottom of the chassis. See the figure on on page 5-36.

note...

Uncovering the protective paper in the next step exposes the adhesive on the gasket. Do not touch or otherwise contaminate the adhesive, or the adhesive may not properly seal the side panel.

4. On the new side panel, remove the protective paper from the gasket attached to the side panel.

note...

When installing the left side panel in the next step, slightly bend up wires at the P1 and P2 pressure connector pins to allow proper fit.

5. Set the side panel in place.

   Make sure the side panel completely sets in place (it should be flush with the exterior of the rear chassis). If not properly fitted, the clamp securing the side panel will not seat.

6. Apply slight pressure to seal the side panel in the rear chassis.

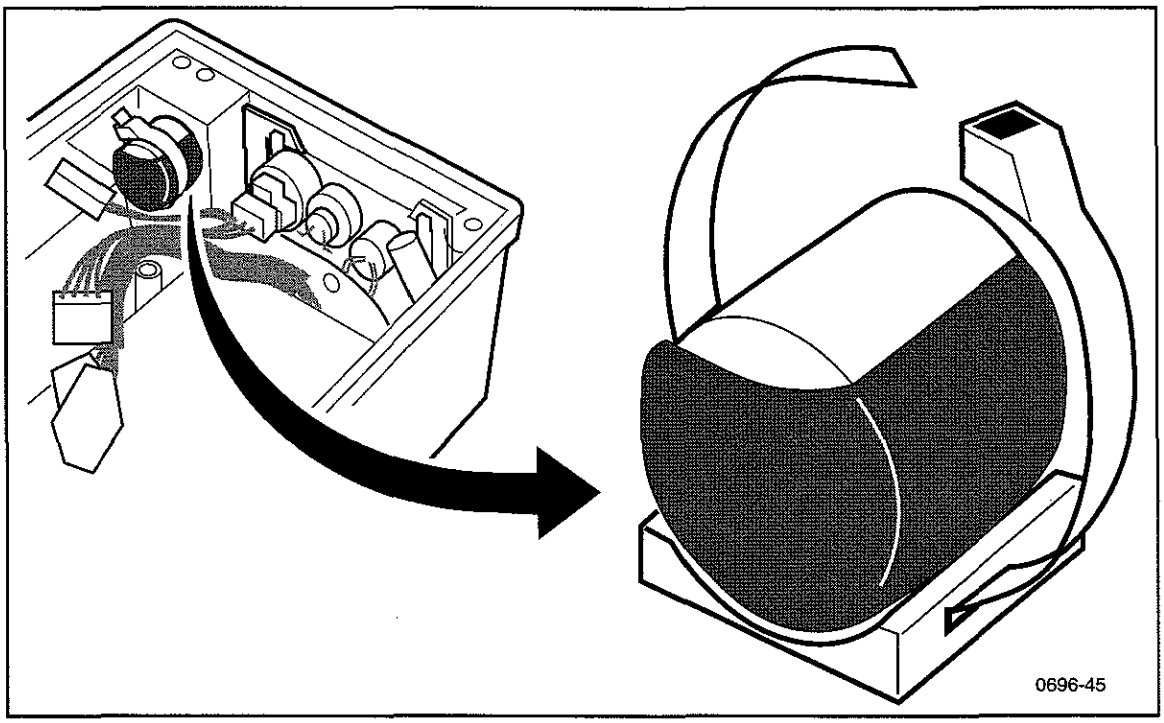
CAUTION

Do not force the clamp in the next step. Forcing it may damage the side panel or rear chassis.

7. Slide the clamp(s) in place with the detent facing the chassis plastic so that it presses against the chassis.

If the clamp requires excessive pressure to slide in place, remove the clamp and check the side panel to be sure it is completely seated.

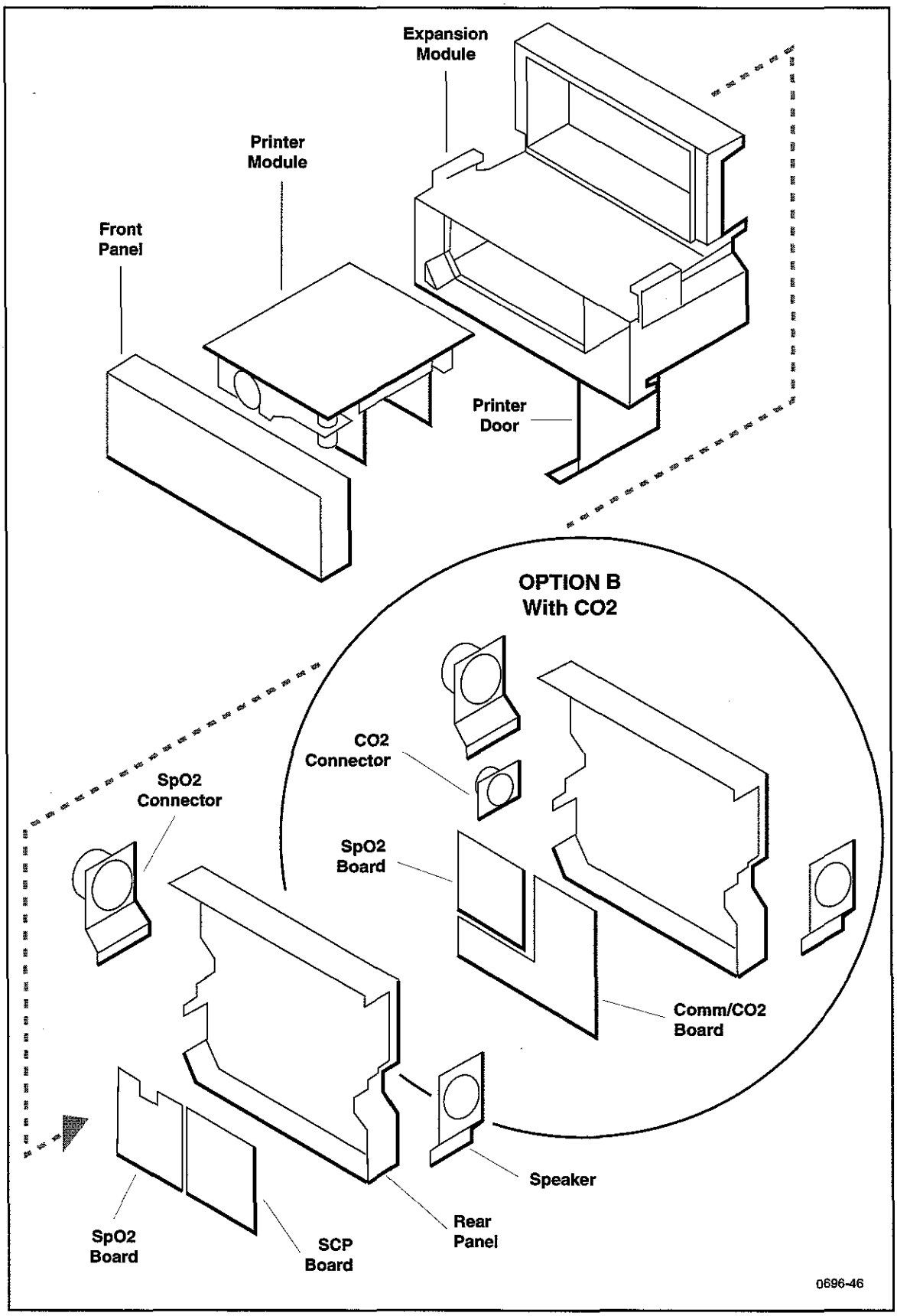
8. Connect all plumbing and cables.
9. When installing the right side panel, install a new tie wrap to secure the bead to the rear chassis (see figure below).



Expansion Module

The expansion module housing contains one or all of the following (refer to figure on page 5-38):

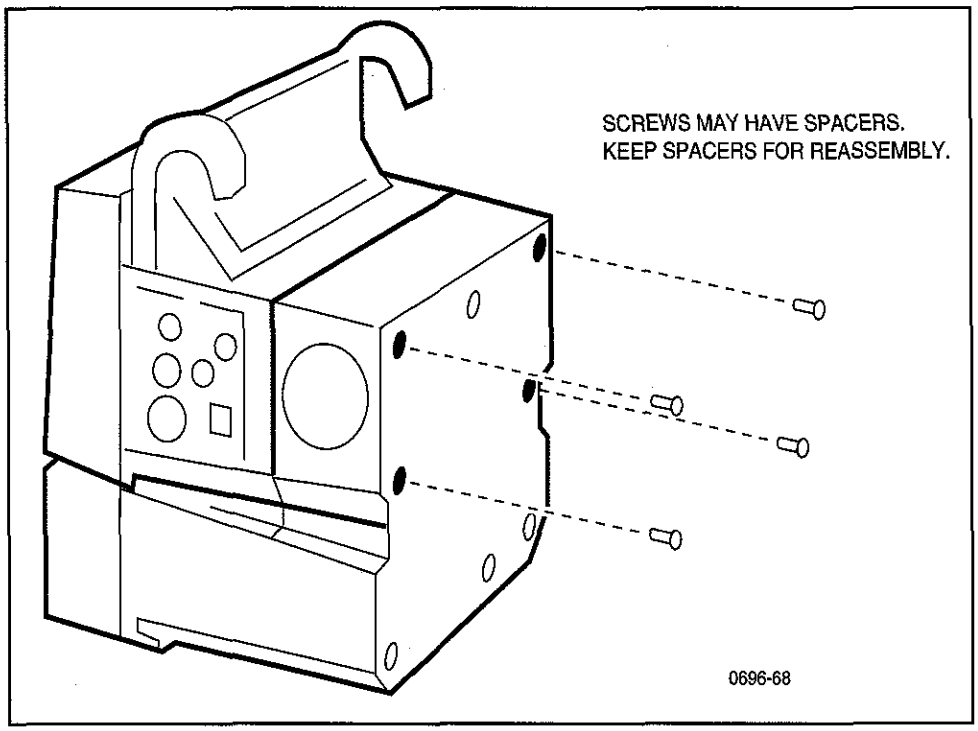
- printer mechanism with printer main board
- Comm/CO_2 board (units with CO_2 option)
- CO_2 connector side panel
- SCP/SpO_2 board (units with printer and SpO_2 options)
- SpO_2 connector side panel
- SpO_2 speaker side panel
- front panel assembly with pushbuttons


Expansion Module
Printer Module
Front Panel
Printer Door
OPTION B With CO2
CO2 Connector
SpO2 Connector
SpO2 Board
Comm/CO2 Board
Speaker
Rear Panel
SpO2 Board
SCP Board
0696-46

The expansion module does not need to be separated from the monitor to replace the expansion module front panel.

Opening Expansion Module

1. Separate the monitor and expansion module according to the procedure **Removing the Dual Battery in Expansion Module** on page 5-9.
2. Remove the four screws securing the rear panel to the expansion module chassis (see figure below).



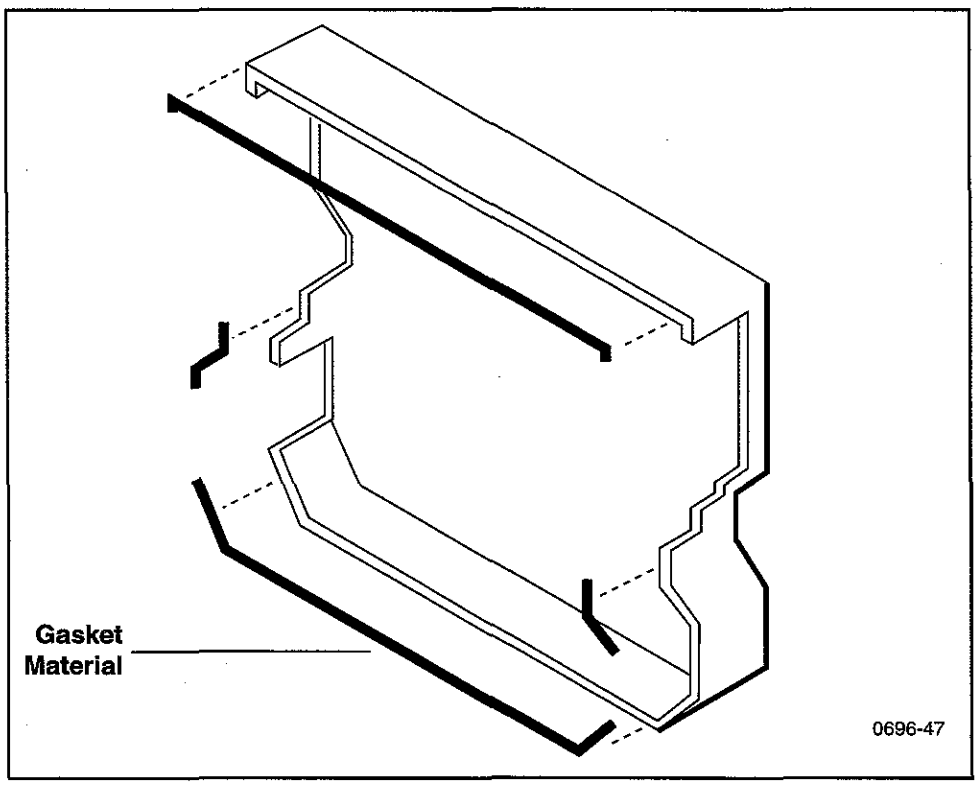
When disconnecting the expansion cable connector in the next step, note that it has two plastic securing clips that must be separated from the connector. These clips are fragile and should be handled carefully.

3. Separate the rear panel from the chassis a few inches (keep any side panels with the rear), then disconnect the expansion cable connector and the printer cable connector from the circuit board (Comm/CO_2 board) in the rear panel.
4. Remove the rear panel with the side panels in place.

The rear panel is sealed to the chassis with rubber gaskets around the perimeter of the rear panel. These gaskets can be reused when reassembling the expansion module. Save these gaskets. Also, spacers might not be secured to the rear panel and can fall out. As the unit is disassembled set aside the spacers for reuse during reassembly.

Closing Expansion Module

1. Make sure all cables are in place and the gaskets removed earlier are available.
2. Set the rubber gaskets in their proper places as shown in the figure below.
3. Connect the printer cable and expansion cable to the Comm/CO_2 board.



4. Set the chassis onto the rear panel, verifying that the gaskets don't slip out of a channel and become pinched between the rear panel and the chassis.

To prevent damage to the expansion module chassis, make sure that the spacers are in place. The chassis may crack if screws are tightened without the spacers in place. Note that the 5 upper spacers are not used when the SpO_2 module is present.

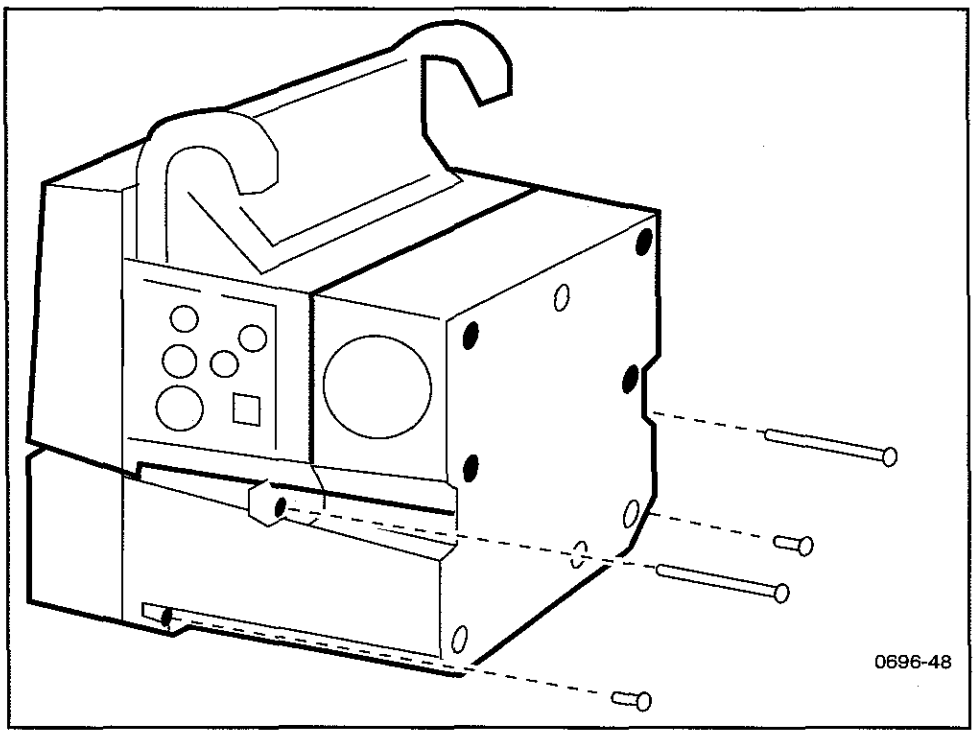
5. Torque screws to 4.75 in-lb to 5.25 in-lb (.54 N-m to .59 N-m).

Replacing Expansion Module Front Panel

The front panel contains the printer buttons. Like the rear panel, the front is sealed to the chassis with a rubber O-ring gasket. This gasket can be re-used when replacing the front panel.

The expansion module front panel is attached to the chassis with four screws. Use the following procedure to remove the front panel:

1. Remove the four screws (see the figure below) holding the front panel.



2. Separate the front panel from the chassis, disconnecting the front panel cable from the expansion module button board.

   A rubber O-ring gasket seals the front panel to the chassis. This gasket should be saved for re-installing on the front panel.

When installing the expansion module front panel:

- Verify the O-ring gasket is in place and not pinched.
- Torque screws to 6.65 in-lbs to 7.35 in-lbs (.75 N-m to .83 N-m)

Replacing Expansion Module Button Board and Buttons

The expansion module contains a button board that has electrical contact areas to detect when an expansion module button is pressed. The front panel buttons are similar to the monitor buttons. A plastic button and flexible contact touches the contact area on the button board when a button is pressed.

Use the following procedure to remove the button board and buttons:

1. Remove the expansion module front panel according to the procedure on page 5-41.
2. Remove the two screws securing the button board to the front panel.
3. Remove the button board.

Do not touch the contact areas on the button board or the contact inside the flexible contacts. Touching these areas may deposit oil on them, reducing the ability of the parts to make electrical contact. If you touch these areas, clean them with a cotton swab moistened with isopropyl alcohol.

4. To remove each button, gently lift out the rubber portion of the button contact attached to the inside of the front panel, then squeeze together the stem ends of the button from the inside of the front panel while gently pushing it out of the button channel. See the figure on page 5-25.

When installing the button board,

- make sure all buttons are completely installed
- make sure the rubber button contact is seated onto the channel
- torque screws to 4.75 in-lbs to 5.25 in-lbs (.54 N-m to .59 N-m).

Replacing the Printer

This section provides instructions on removing and installing the printer mechanism and printer main board. These two components are provided as a replacement unit called the printer assembly.

Do not attempt to separate the printer mechanism from the printer main board. Replace these as a unit.

Removing Printer

Remove the printer assembly according to the following instructions.

1. Remove any printer paper.
2. Open the Expansion Module according to the procedure on page 5-39.
3. Remove the Expansion Module front panel according to the procedure on page 5-41.

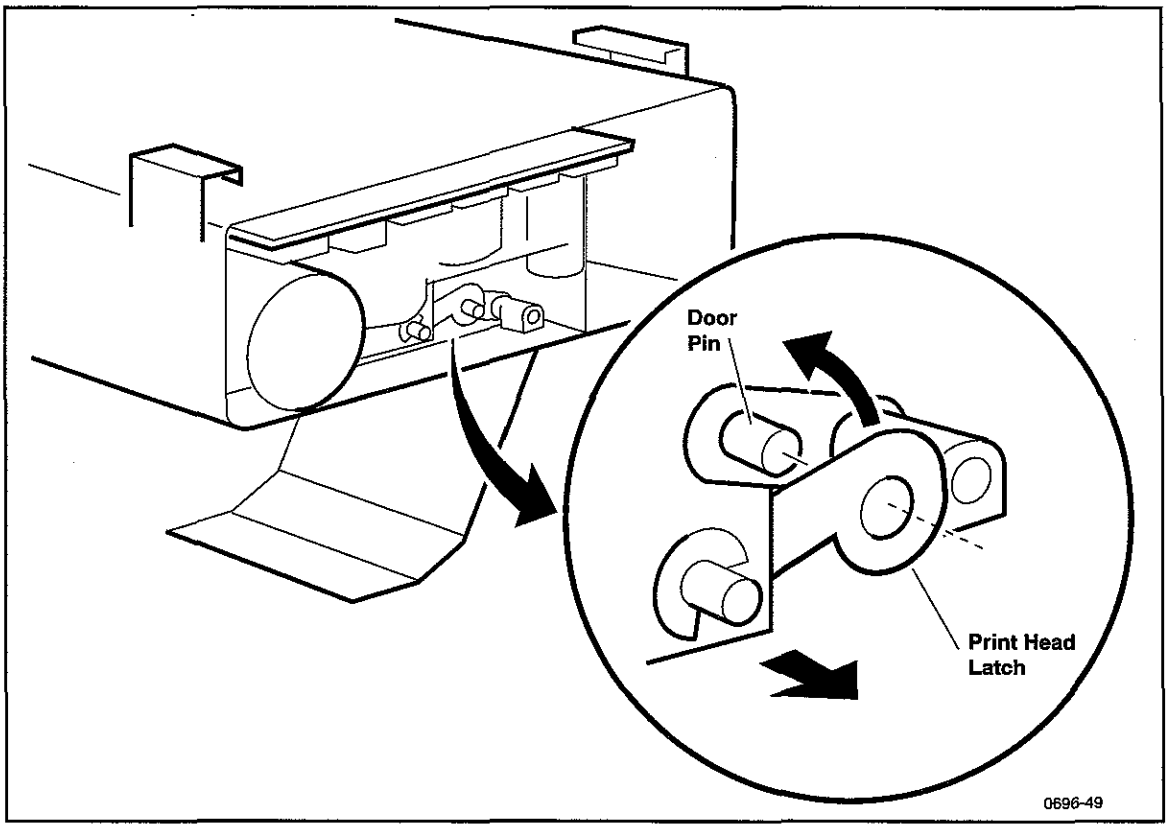
4. Disconnect the front panel button cable from the front of the Printer Main board.

When removing the shield in the next step, be careful not to tear it. The shield is held in place by double-sided adhesive pads.

5. Carefully remove the plastic shield from the rear of the Expansion Module chassis. Set this shield aside.
6. Disconnect the battery cable and printer cable from the rear of the Printer Main board.
7. Lay the chassis on its back.
8. Completely open the paper door.

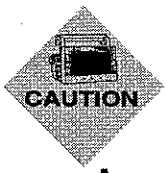
As you remove the printer assembly from the chassis in the next step, rotate the printer door latch mechansim counter-clockwise to clear the chassis.

9. Carefully slide the printer assembly out the front of the chassis. The printer assembly fits snugly, requiring some force to slide it out, and the door latch mechanism must be rotated counter-clockwise after it disengages from the printer door pin. See the figure on page 5-44.



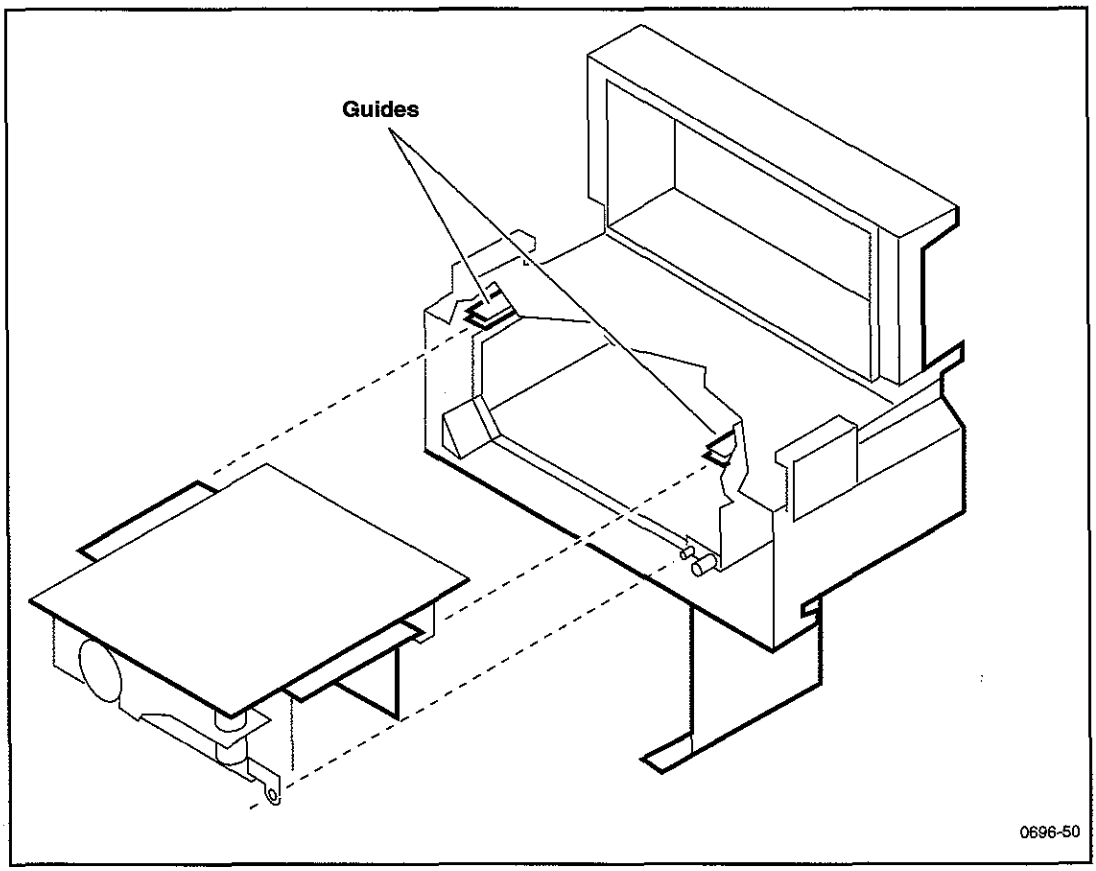
Installing Printer

1. Lay the chassis on its back
2. Completely open the paper door.

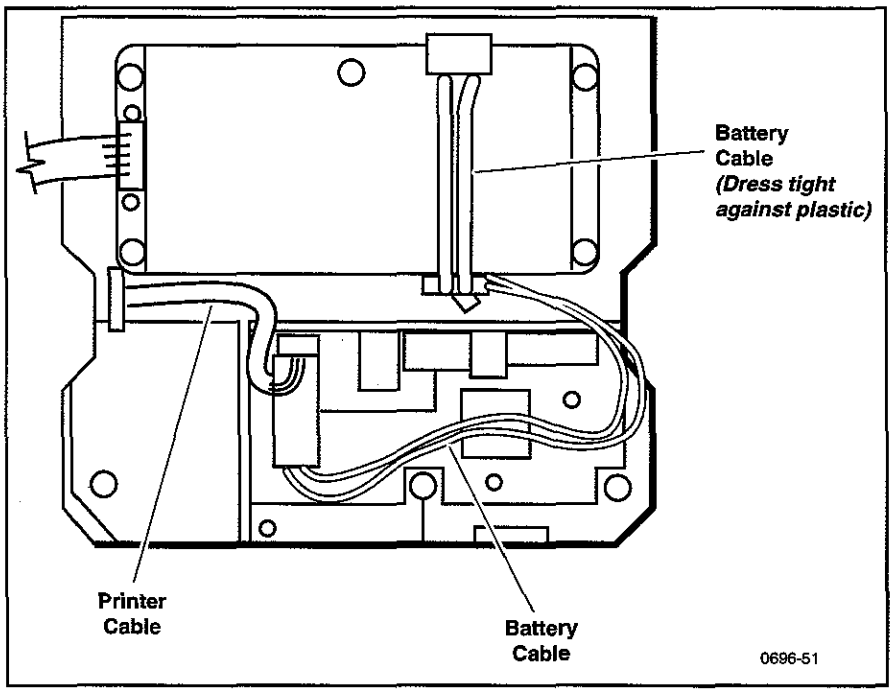


As you install the printer assembly, rotate the printer door latch mechansim out of the way so it clears the chassis. The assembly fits snugly, but should not require much force to slide it in place.

3. Slide the printer assembly into the guides as shown on page 5-45, making sure that after the door latch mechanism clears the chassis you rotate it clockwise to engage the printer door pin. See the figure above.



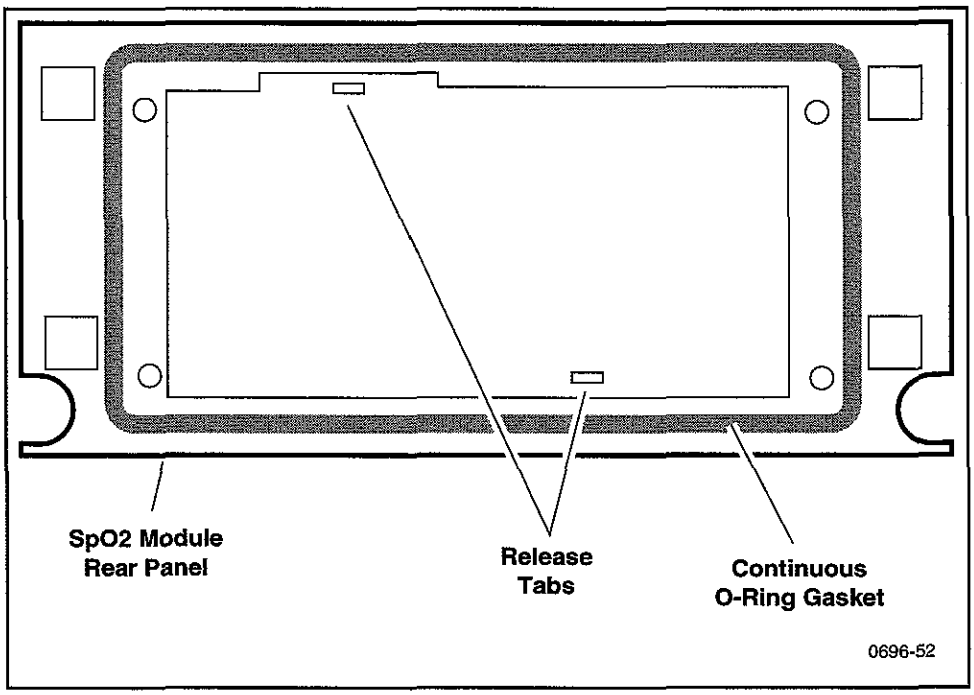
4. Carefully close and open the door a couple times to check that the door pin and latch mechanism function without binding.
5. Connect the battery cable and printer cable to the Printer Main board. It is important to properly dress the cables as shown on page 5-46.



6. Connect the button cable to the front of the Printer Main board.
7. Install the Expansion Module front panel, close the Expansion Module, and reattach it to the monitor.

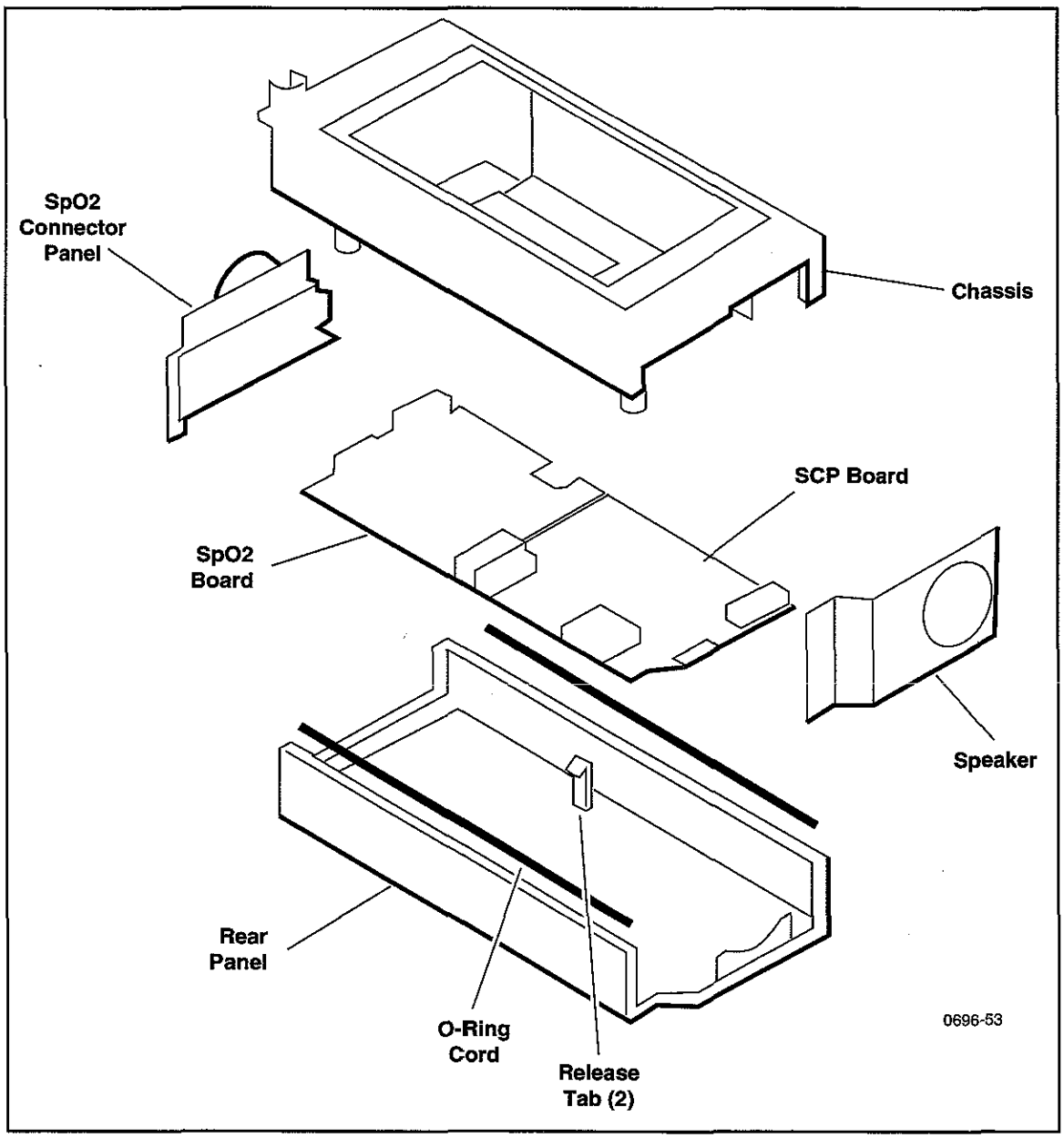
Opening the SpO_2 Module

1. Separate the SpO_2 module from the monitor according to the procedure **Removing the Dual Battery in SpO2 Module** on page 5-11.
2. Two tabs secure the SpO_2 module rear panel to the SpO_2 module chassis. Using a small screwdriver or your finger, press on each of the tabs inside the SpO_2 module chassis while applying pressure to separate the rear panel from the chassis (see figure on on page 5-47). (When separating the rear panel from the chassis, make sure the side panels remain seated in the rear panel.)



3. Once the tabs allow the rear panel to be removed, separate the rear panel from the chassis.

   The rear panel is sealed to the chassis with rubber O-ring gaskets. These gaskets can be reused when re-assembling the SpO_2 module.



When closing the SpO_2 module, verify no O-ring gasket slips out of its channel and becomes pinched between the rear panel and the chassis.

Replacing the SpO_2 Circuit Boards

The following instructions describe how to replace the two SpO_2 circuit boards in the SpO_2 module and in the expansion module without the CO_2 option. Instructions for replacing SpO_2 boards in an expansion module with the CO_2 option are described in **Replacing the CO2/SpO2 Circuit Boards** on page 5-50.

When replacing the SpO_2 circuit boards, remove both circuit boards with the patient connector side panel still connected. Attempting to disconnect the patient connector side panel from the SpO_2 circuit board before removing both circuit boards with the side panel can damage the flex-cable between the side panel and the SpO_2 circuit board.

1. Open the SpO_2 module or expansion module according to the procedure on page 5-11.

In the next step, the connector securing clips are fragile and will break if not handled carefully.

2. Disconnect the cable(s) from the SpO_2 SCP board by carefully releasing the securing clips and unplugging the connectors.
3. Disconnect the speaker cable from the SCP board.
4. Remove the speaker side panel from the chassis.
5. Remove the two screws securing the SCP board and SpO_2 board to the rear panel.
6. Lift out the two circuit boards and patient connector side panel as a unit. (The side panel easily slides out.)
7. Using equal pressure on both sides of the connector, disconnect the patient connector side panel connector from the SpO_2 circuit board.
8. Disconnect the two circuit boards by gently pulling them apart.

When installing the SpO_2 circuit boards first, plug the two circuit boards together. Then:

- Connect the patient connector side panel connector to the SpO_2 circuit board.
- Set the two circuit boards and side panels in place, making sure that the boards are seated on the support tabs.
- Torque screws to 4.75 in-lbs to 5.25 in-lbs (.54 N-m to .59 N-m).
- Reconnect the printer and expansion cables to the SCP board.

Replacing the CO_2/SpO_2 Circuit Boards

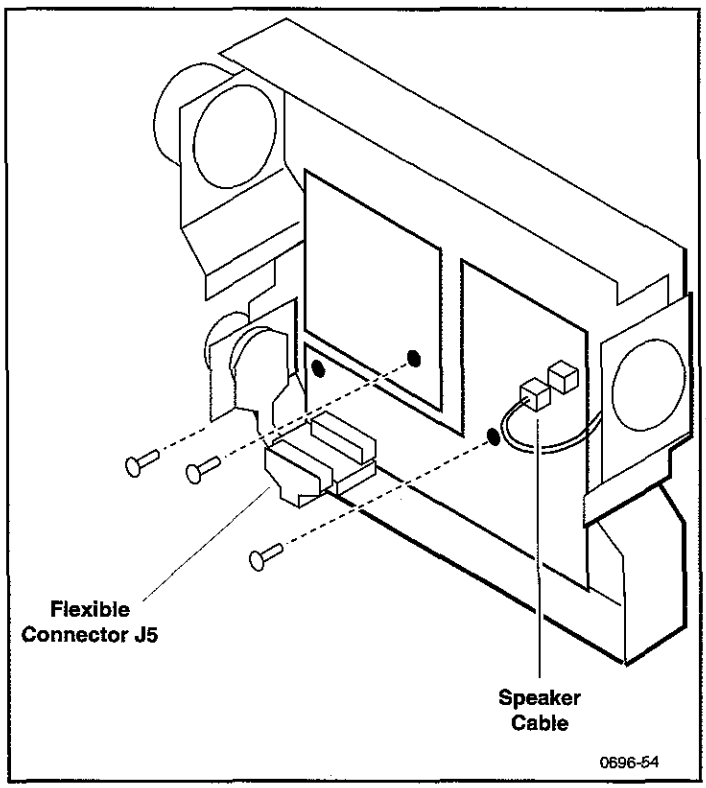
The following instructions describe how to replace the two CO_2/SpO_2 circuit boards in the expansion module with the CO_2 option. Instructions for replacing SpO_2 boards in SpO_2 module and expansion module without the CO_2 option installed are described in **Replacing the SpO2 Circuit Boards** on page 5-49

When replacing the CO_2/SpO_2 circuit boards, remove both circuit boards with the patient connector side panel still connected. Attempting to disconnect the patient connector side panel from the SpO_2 circuit board before removing both circuit boards with the side panel can damage the flex-cable between the side panel and the SpO_2 circuit board.

1. Open the expansion module according to the procedure described in on page 5-11.

In the next step, the connector securing clips are fragile and will break if not handled carefully.

2. Unplug the flex-cable connector J5 from the CO_2 board, but do not attempt to remove the CO_2 connector side panel.



3. Disconnect the speaker cable from the CO_2 board and remove the speaker side panel.
4. Remove the three screws securing the CO_2 board and SpO_2 board to the rear panel (see the figure above).
5. Lift out the two circuit boards and SpO_2 patient connector side panel as a unit. (The side panel easily slides out.)
6. Using equal pressure on both sides of the connector, disconnect the patient connector side panel connector from the SpO_2 circuit board.
7. Disconnect the two circuit boards by gently pulling them apart.

When installing the CO_2/SpO_2 circuit boards:

- plug the two circuit boards together
- connect the patient connector side panel connector to the SpO_2 circuit board
- set the two circuit boards and side panels in place, making sure that the boards are seated on the support tabs
- torque screws to 4.75 in-lbs to 5.25 in-lbs (.54 N-m to .59 N-m)
- reconnect the CO_2 patient connector cable

Replacing Expansion Module Side Panels

The side panels easily slide out once the chassis and rear panel are separated. If the patient connector side panel is being replaced, this side panel and the two circuit boards must be removed together before disconnecting the side panel from the circuit board. Refer to Replacing the SpO_2 Circuit Boards or Replacing the CO_2/SpO_2 Circuit Boards earlier.

If the speaker side panel is being replaced, separate the chassis and rear panel as described earlier in this section, disconnect the speaker from the SCP or CO_2 board, and slide out the speaker side panel.

Section 6
Technical Overview

This section describes the electronics of the Encore monitor and three of its options: Printer, Pulse Oximetry (SpO_2), and Capnography (CO_2).

This section is intended as an aid to servicing at the field replaceable unit level and contains only system-level and functional-level circuit descriptions.

When replacing modules or components, refer to Section 5, Repair Procedures. Parts numbers for replaceable parts are located in Section 7.

System Description

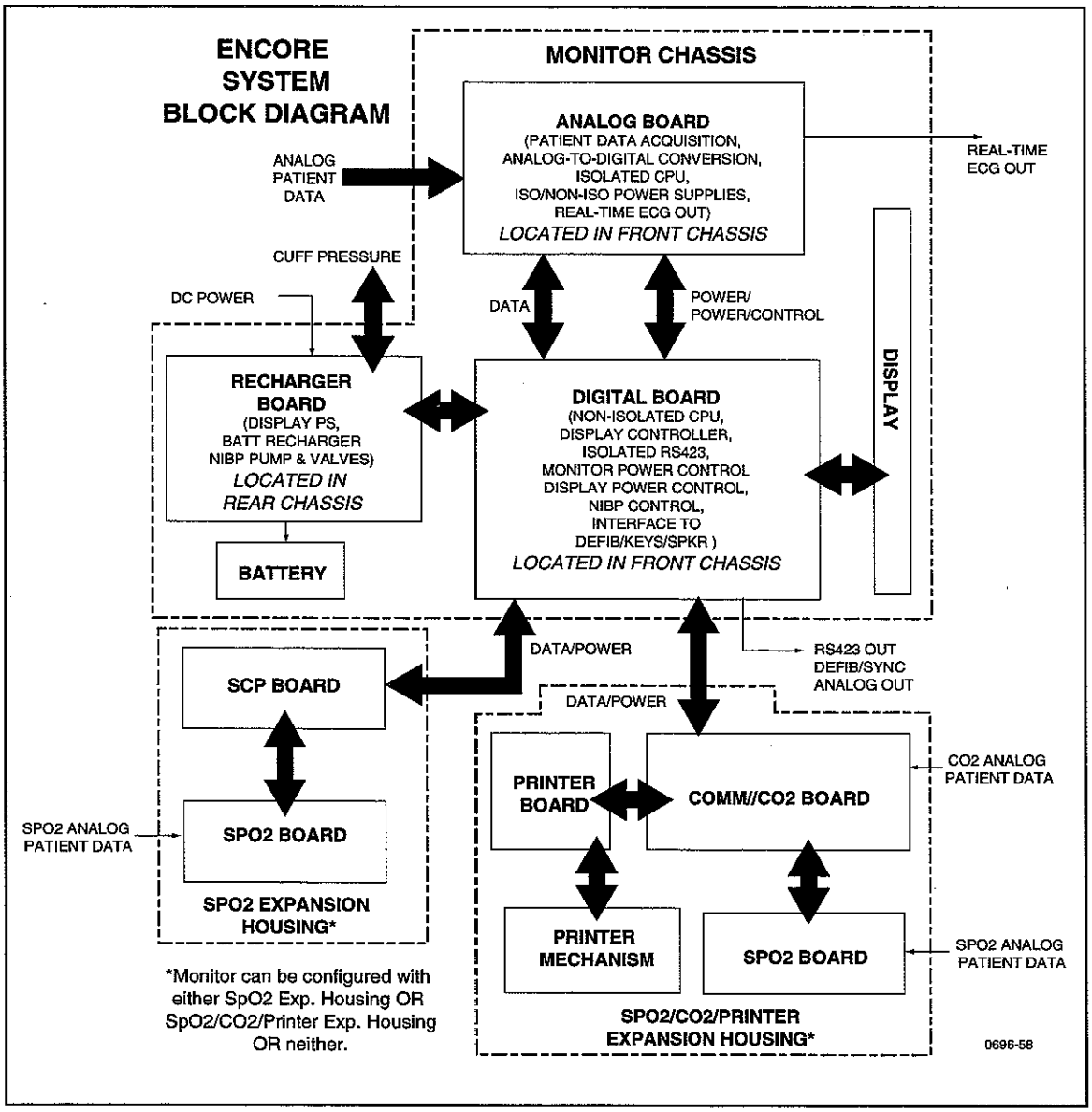
The Encore monitor can be configured as a stand-alone monitor or with one of two optional housings containing different monitoring and printer options. The figure on page 6-2 illustrates the possible housing configurations.

The main functional modules (e.g. Analog Board, Recharger Board, Printer, SCP Board, etc.) reside in the housings. The figure on page 6-3 illustrates the location of the main functional modules in the Propaq Encore monitoring system housings.

The Encore *monitor* electronics reside on three circuit boards within the monitor housing (front and rear chassis). Additional circuitry for the *printer* and *optional monitoring parameters* reside on additional circuit boards housed in the expansion modules.

The Encore system block diagram is shown on page 6-4.

The Encore electronics consist of the power system, monitoring electronics, and the cuff pneumatics.


ENCORE SYSTEM BLOCK DIAGRAM
MONITOR CHASSIS
ANALOG BOARD
(PATIENT DATA ACQUISITION, ANALOG-TO-DIGITAL CONVERSION, ISOLATED CPU, ISO/NON-ISO POWER SUPPLIES, REAL-TIME ECG OUT)
LOCATED IN FRONT CHASSIS
ANALOG PATIENT DATA
REAL-TIME ECG OUT
CUFF PRESSURE
DC POWER
DATA
POWER/ POWER/CONTROL
DISPLAY
RECHARGER BOARD
(DISPLAY PS, BATT RECHARGER NIBP PUMP & VALVES)
LOCATED IN REAR CHASSIS
DIGITAL BOARD
(NON-ISOLATED CPU, DISPLAY CONTROLLER, ISOLATED RS423, MONITOR POWER CONTROL DISPLAY POWER CONTROL, NIBP CONTROL, INTERFACE TO DEFIB/KEYS/SPKR)
LOCATED IN FRONT CHASSIS
BATTERY
DATA/POWER
RS423 OUT
DEFIB/SYNC
ANALOG OUT
SCP BOARD
DATA/POWER
PRINTER BOARD
COMM//CO2 BOARD
CO2 ANALOG PATIENT DATA
SPO2 ANALOG PATIENT DATA
SPO2 BOARD
SPO2 EXPANSION HOUSING*
PRINTER MECHANISM
SPO2 BOARD
SPO2 ANALOG PATIENT DATA
SPO2/CO2/PRINTER EXPANSION HOUSING*
*Monitor can be configured with either SpO2 Exp. Housing OR SpO2/CO2/Printer Exp. Housing OR neither.
0696-58

Power Electronics Description

The power system circuits are located on the Analog, Digital, and Recharger boards. The power system includes the ac mains power adapter. Refer to the figure on page 6-6.

The power system

- converts ac mains current to dc current (external power adapter)
- recharges the internal battery pack (Recharger board)
- converts battery power to several voltages for the display (Recharger board)
- converts battery power to several regulated and unregulated power supplies for both isolated and non-isolated electronics (Analog board)
- provides isolated power for RS423 communications (Digital board)
- controls the activation and deactivation of the power system (Digital board)

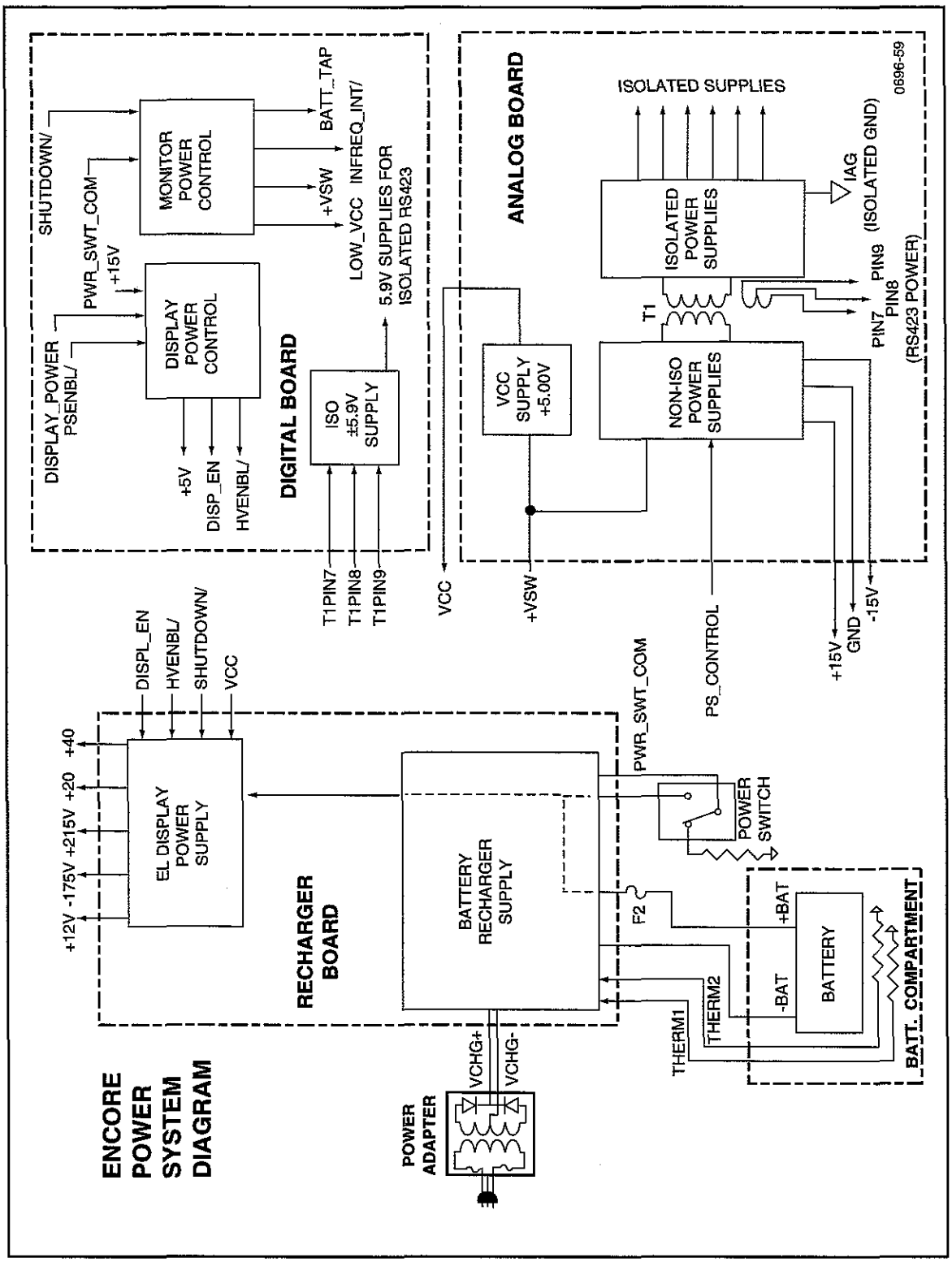
Power is delivered from ac mains to the monitor through a power adapter. The adapter converts ac to dc current at approximately 15 Volts.

The internal battery continually supplies monitor power and is recharged while the power adapter is plugged into ac mains and connected to the monitor. The monitor can also be recharged from any dc power source that meets the monitor's dc power input specifications. An accessory cable is available from Protocol Systems to allow connection of such a power source to the dc power input connector on the monitor's right side panel. This cable must be used for monitor calibration.

Thermistors in the battery compartment monitor battery temperature. As battery charging takes place, battery temperature rises. The recharger output voltage is temperature-compensated; as battery temperature rises, maximum recharger output voltage decreases.

Switching power supplies generate power for recharging the battery, for powering the display, and for other power sources throughout the monitor. Suppression devices designed into the power system provide EMI suppression. A transformer bridges the battery power to the isolated electronics.

Several control lines activate and deactivate the power supplies. These control lines originate on the Digital board and are routed to the Recharger board and Analog board to activate the display power supply and the main power supply. The recharger supply is automatically activated any time an adequate dc power source is connected to the power input jack on the monitor's right side panel.


ENCORE POWER SYSTEM DIAGRAM
DIGITAL BOARD
ANALOG BOARD
RECHARGER BOARD
BATT. COMPARTMENT
SHUTDOWN/
PWR_SWT_COM
+15V
DISPLAY_POWER PSENBL/
MONITOR POWER CONTROL
DISPLAY POWER CONTROL
BATT_TAP
+VSW
LOW_VCC INFREQ_INT/
5.9V SUPPLIES FOR ISOLATED RS423
+5V
DISP_EN
HVENBL/
ISO ±5.9V SUPPLY
T1PIN7
T1PIN8
T1PIN9
VCC
VCC SUPPLY +5.00V
+VSW
ISOLATED SUPPLIES
ISOLATED POWER SUPPLIES
IAG (ISOLATED GND)
0696-59
T1
NON-ISO POWER SUPPLIES
PIN9
PIN8
PIN7
(RS423 POWER)
+15V
GND
-15V
PS_CONTROL
PWR_SWT_COM
POWER SWITCH
DISPL_EN
HVENBL/
SHUTDOWN/
VCC
+12V -175V +215V +20 +40
EL DISPLAY POWER SUPPLY
BATTERY RECHARGER SUPPLY
F2
+BAT
-BAT
BATTERY
THERM2
THERM1
POWER ADAPTER
VCHG+
VCHG-

Monitoring Electronics System Description

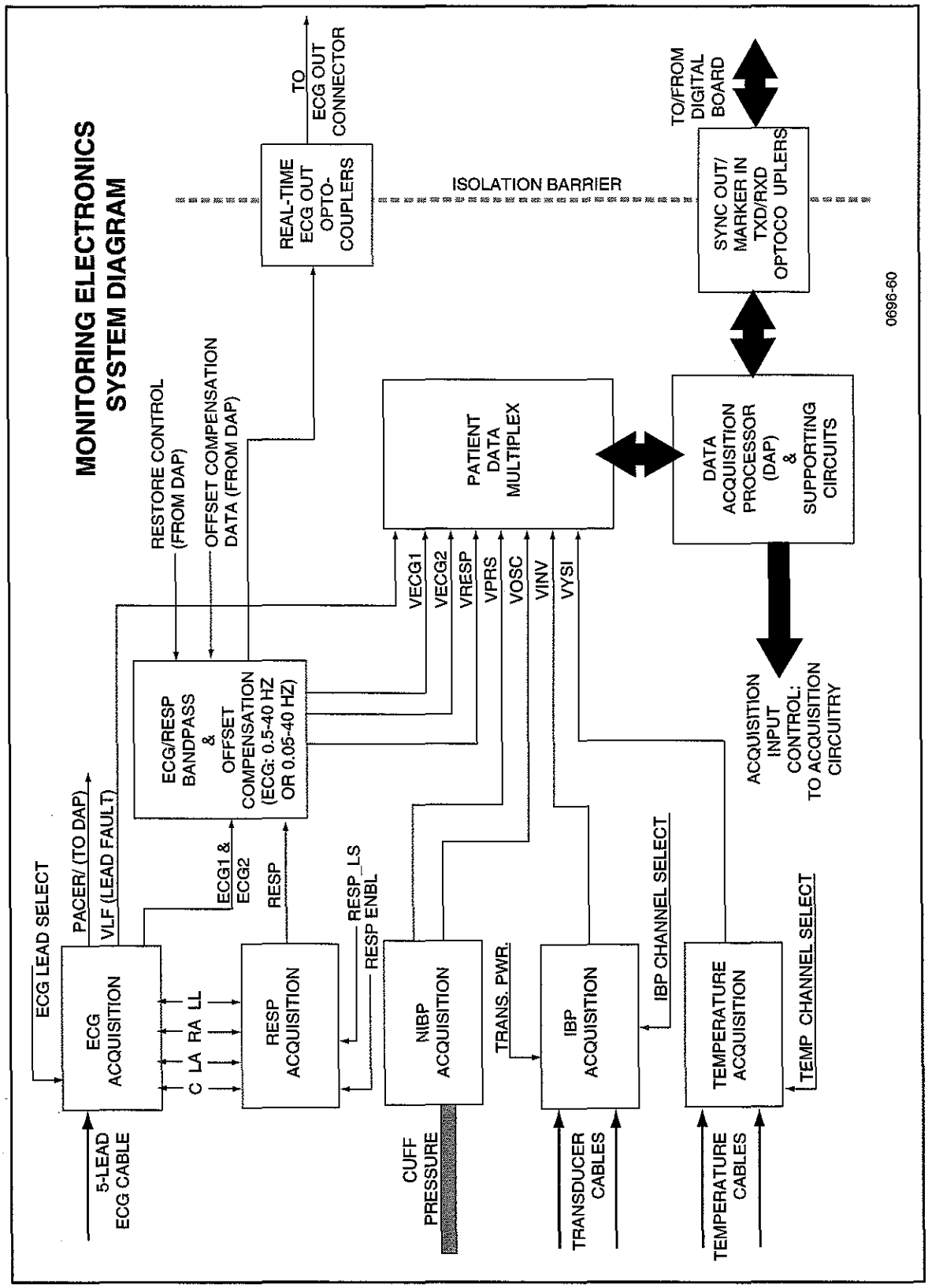
The monitoring electronics reside on the Analog and Digital boards located in the front chassis assembly. Refer to the figure on page 6-8.

These circuits

- acquire the physiological signals from coupling devices (electrodes, transducers, and probes)
- convert the analog signal to digital data
- process the data for display and alarm monitoring
- display the data and any alarm conditions
- transmits the analog ECG signal across the isolation barrier for real-time analog ECG output

Isolation barriers on the Analog and Digital boards isolate the circuits connected to the patient from circuits connected to other devices including the monitor's power input. Communications and power delivery across the isolation barrier are achieved using opto-couplers and a transformer rated for medical applications.

Microcontrollers (μCs) control patient data processing, alarm monitoring and display.


MONITORING ELECTRONICS
SYSTEM DIAGRAM
0696-60
TO
ECG OUT
CONNECTOR
REAL-TIME
ECG OUT
OPTO-
COUPLERS
ISOLATION BARRIER
SYNC OUT/
MARKER IN
TXD/RXD
OPTOCO UPLERS
TO/FROM
DIGITAL
BOARD
RESTORE CONTROL
(FROM DAP)
OFFSET COMPENSATION
DATA (FROM DAP)
PATIENT
DATA
MULTIPLEX
DATA
ACQUISITION
PROCESSOR
(DAP)
&
SUPPORTING
CIRCUITS
VECG1
VECG2
VRESP
VPRS
VOSC
VINV
VYSI
ECG/RESP
BANDPASS
&
OFFSET
COMPENSATION
(ECG: 0.5-40 HZ
OR 0.05-40 HZ)
ACQUISITION
INPUT
CONTROL:
TO ACQUISITION
CIRCUITRY
ECG LEAD SELECT
PACER/ (TO DAP)
VLF (LEAD FAULT)
ECG1 &
ECG2
RESP
RESP_LS
RESP ENBL
ECG
ACQUISITION
C LA RA LL
RESP
ACQUISITION
NIBP
ACQUISITION
TRANS. PWR.
IBP
ACQUISITION
IBP CHANNEL SELECT
TEMPERATURE
ACQUISITION
TEMP CHANNEL SELECT
5-LEAD
ECG CABLE
CUFF
PRESSURE
TRANSDUCER
CABLES
TEMPERATURE
CABLES

NIBP Pneumatics Description

The NIBP (cuff) system:

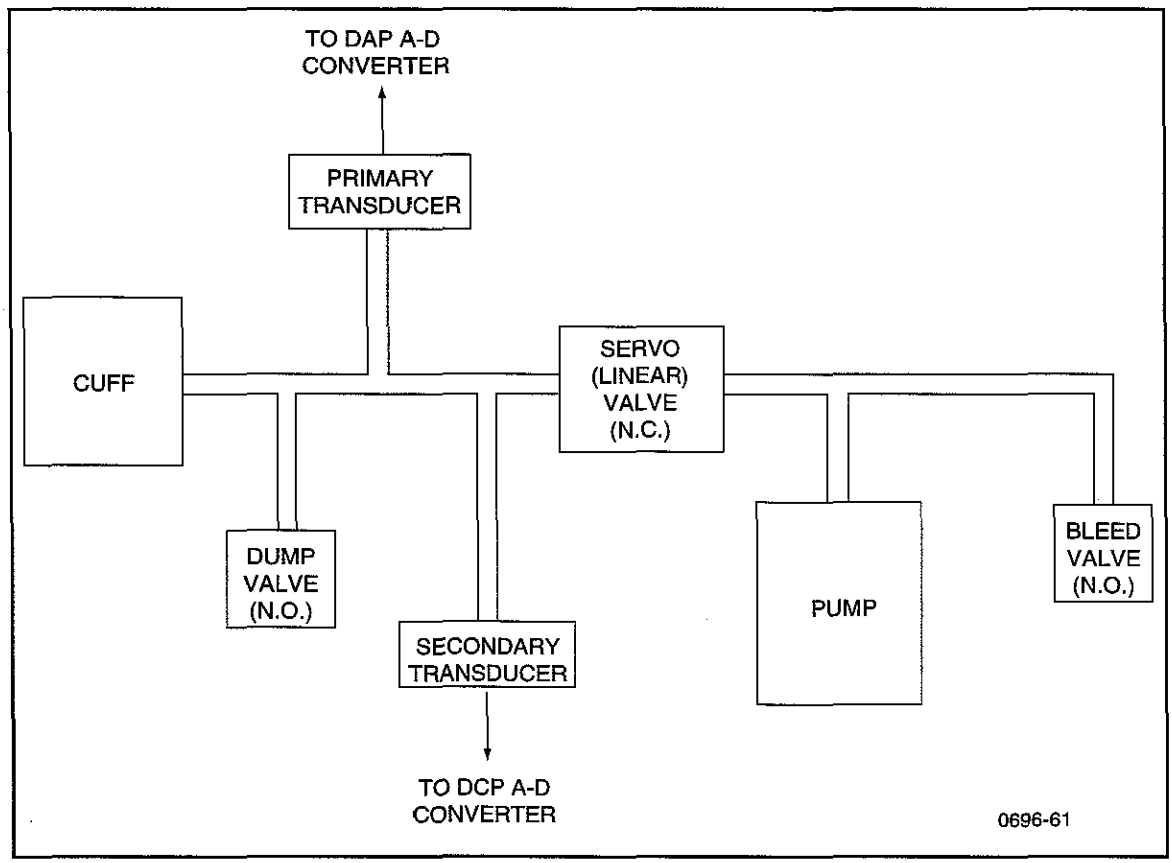
- inflates the cuff to a target cuff pressure
- converts the cuff air pressure to an electrical signal using a pressure transducer
- deflates the cuff in a controlled manner while the monitoring electronics determines blood pressure
- protects the patient from cuff over-inflation

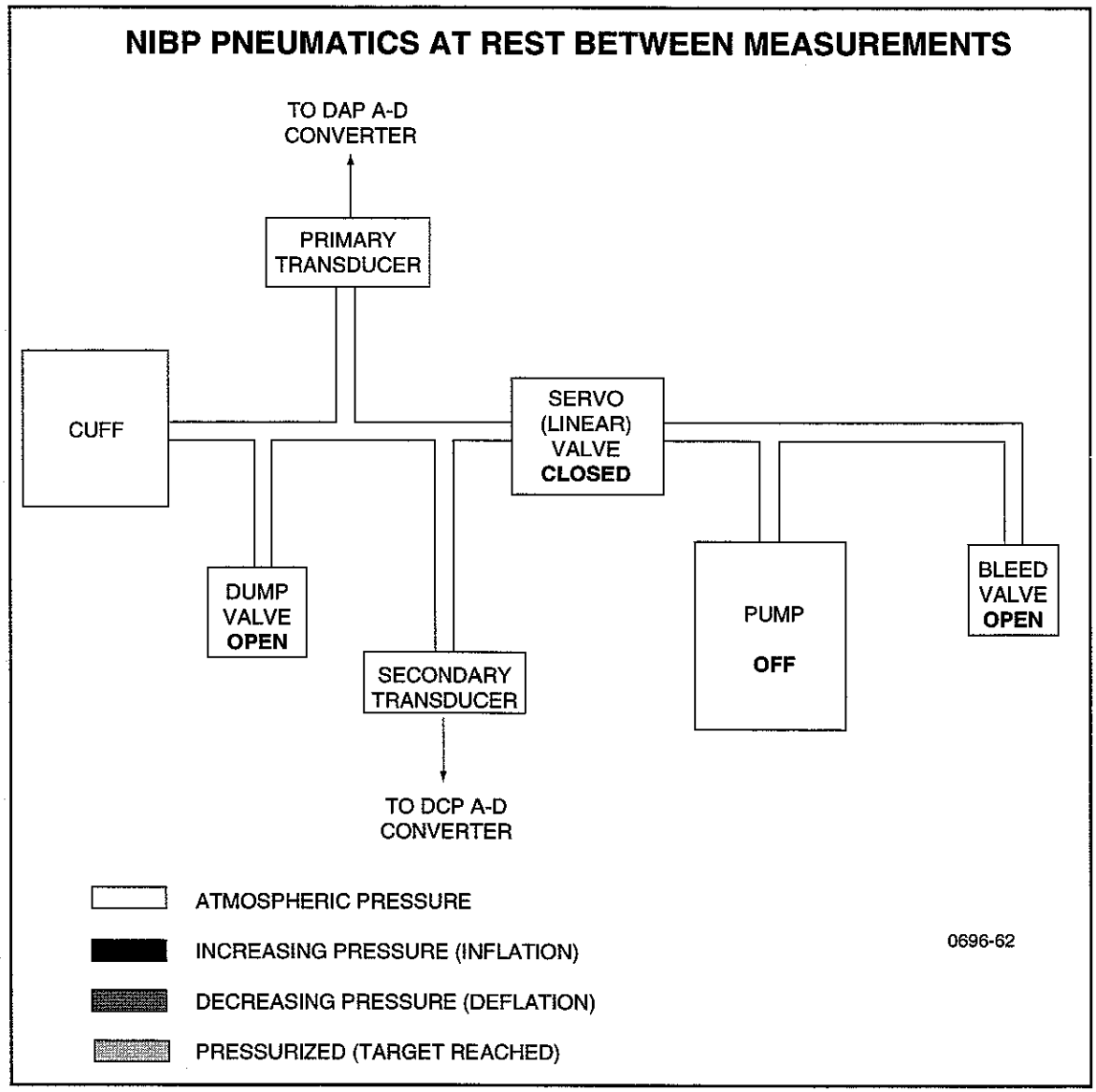
The NIBP air system consists of the pump, air valves, transducers, and the cuff. Except for the primary transducer and cuff, all NIBP pneumatic components are located on the Recharger board.

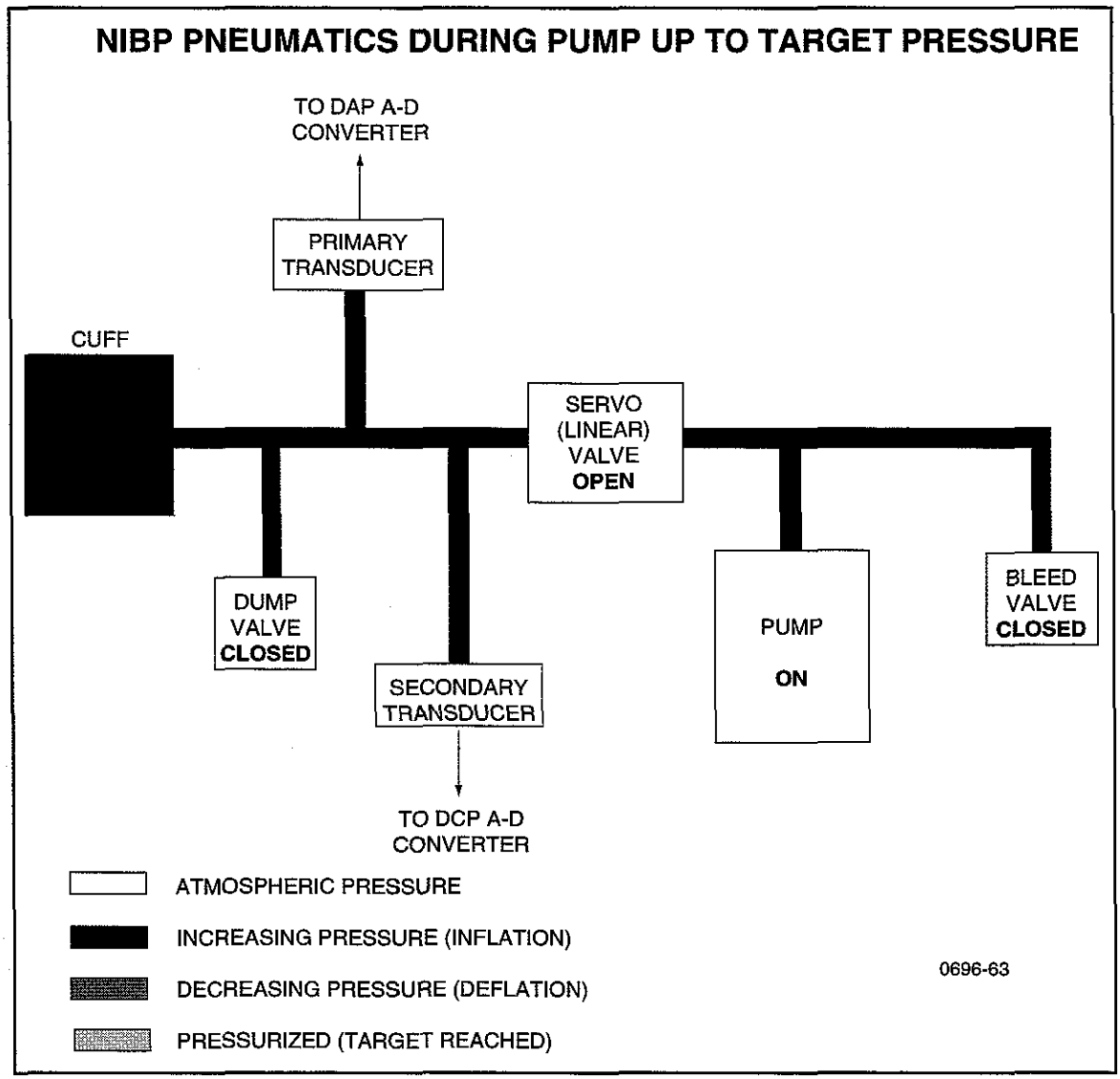
The pump inflates the cuff only when the bleed and dump valves are closed. These two valves are normally open to ensure the NIBP tubing does not remain pressurized when the valves are not energized. The linear valve's programmable iris determines the cuff inflation and deflation (bleed) rate.

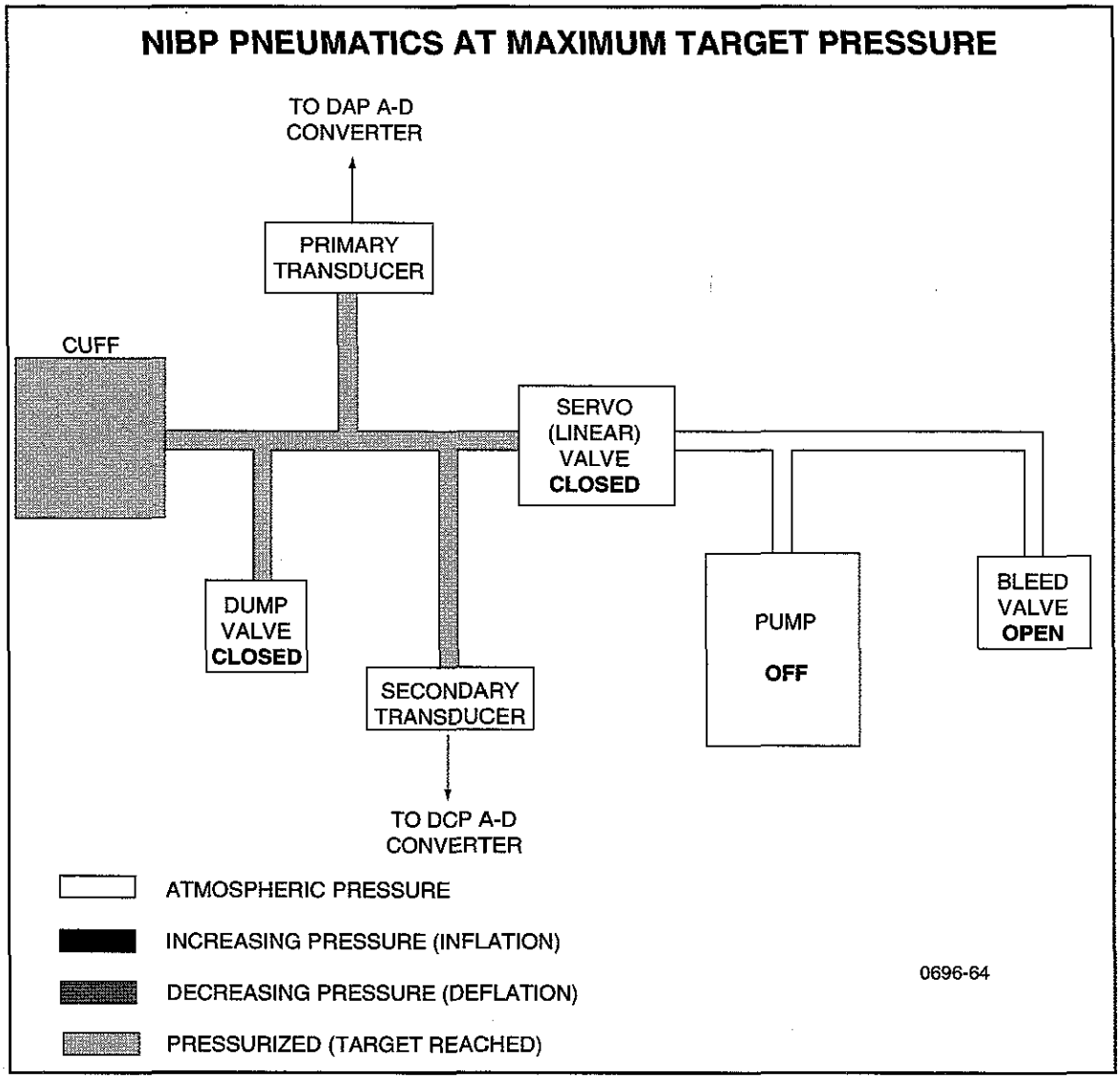
Two transducers provide redundancy in pressure monitoring to ensure accurate readings and to ensure cuff deflation in an over-pressure condition. If the cuff pressure reaches the maximum allowable pressure for the patient class (adult, pede, or neonate), the dump valve opens to quickly deflate the cuff.

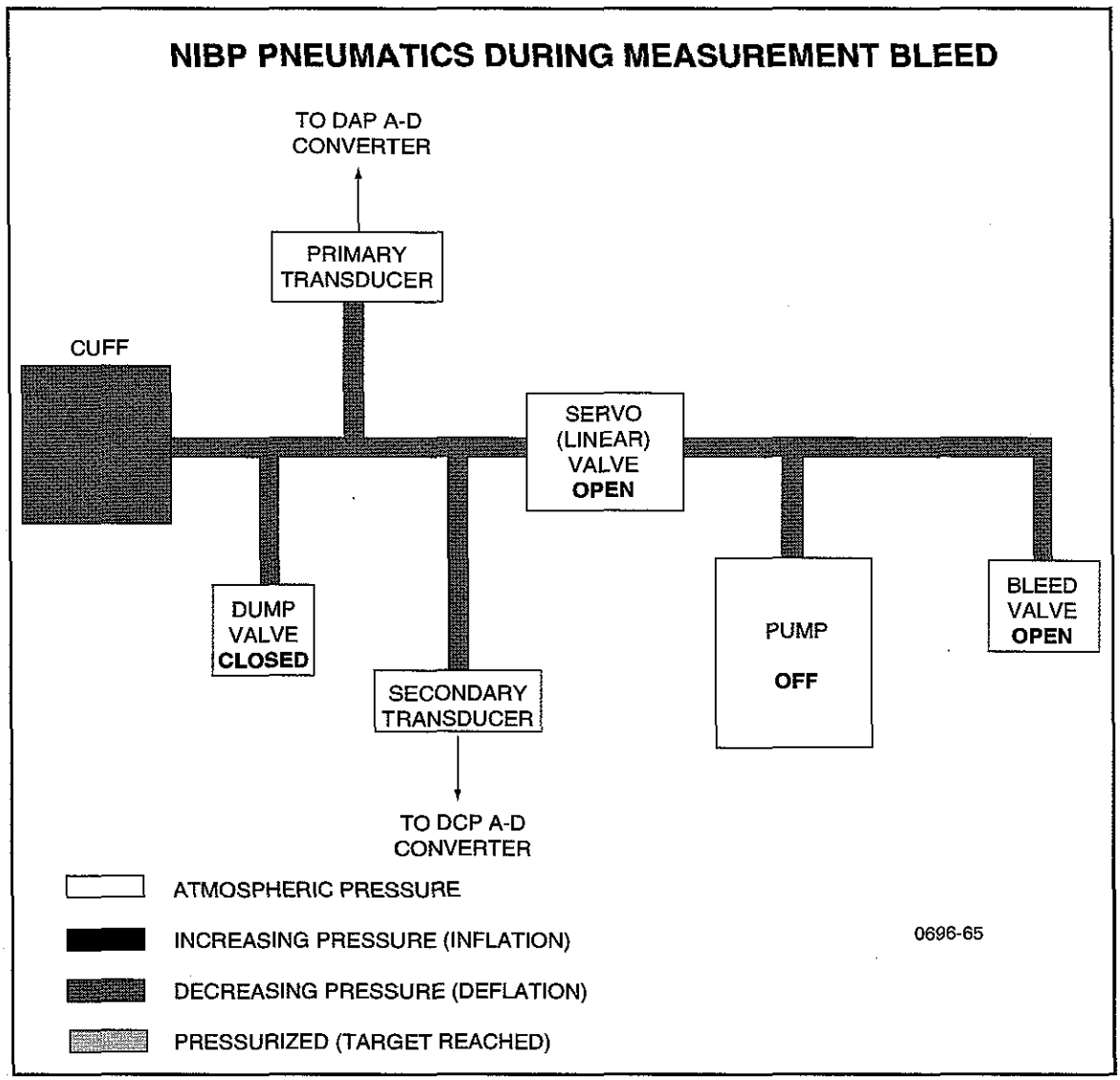
The figures on the following pages illustrate the pressure conditions during a typical NIBP measurement process.

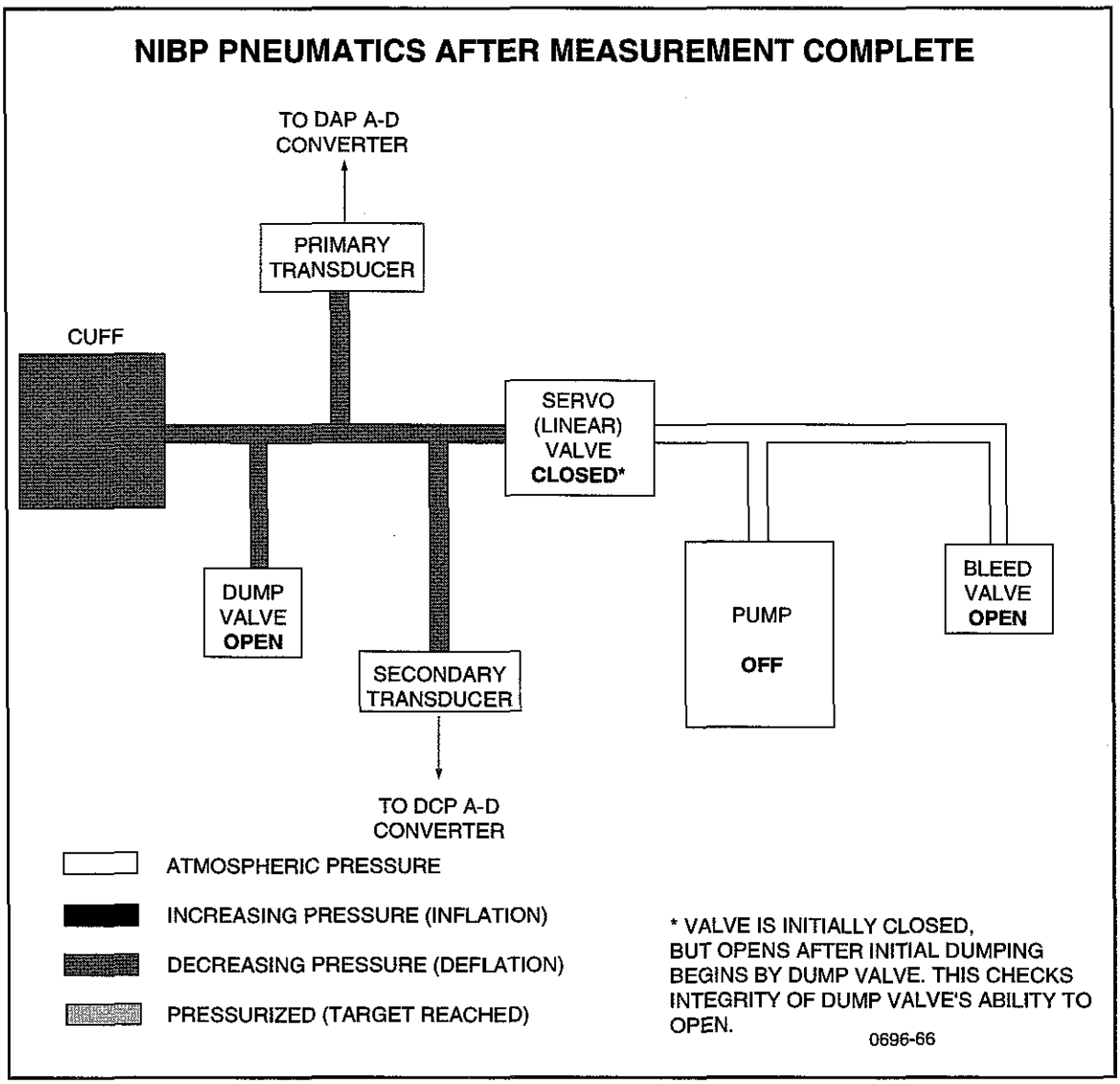



NIBP PNEUMATICS AT REST BETWEEN MEASUREMENTS
TO DAP A-D CONVERTER
PRIMARY TRANSDUCER
CUFF
SERVO (LINEAR) VALVE CLOSED
DUMP VALVE OPEN
SECONDARY TRANSDUCER
PUMP OFF
BLEED VALVE OPEN
TO DCP A-D CONVERTER
ATMOSPHERIC PRESSURE
INCREASING PRESSURE (INFLATION)
DECREASING PRESSURE (DEFLATION)
PRESSURIZED (TARGET REACHED)
0696-62


NIBP PNEUMATICS DURING PUMP UP TO TARGET PRESSURE
TO DAP A-D CONVERTER
PRIMARY TRANSDUCER
CUFF
SERVO (LINEAR) VALVE OPEN
DUMP VALVE CLOSED
SECONDARY TRANSDUCER
PUMP ON
BLEED VALVE CLOSED
TO DCP A-D CONVERTER
ATMOSPHERIC PRESSURE
INCREASING PRESSURE (INFLATION)
DECREASING PRESSURE (DEFLATION)
PRESSURIZED (TARGET REACHED)
0696-63

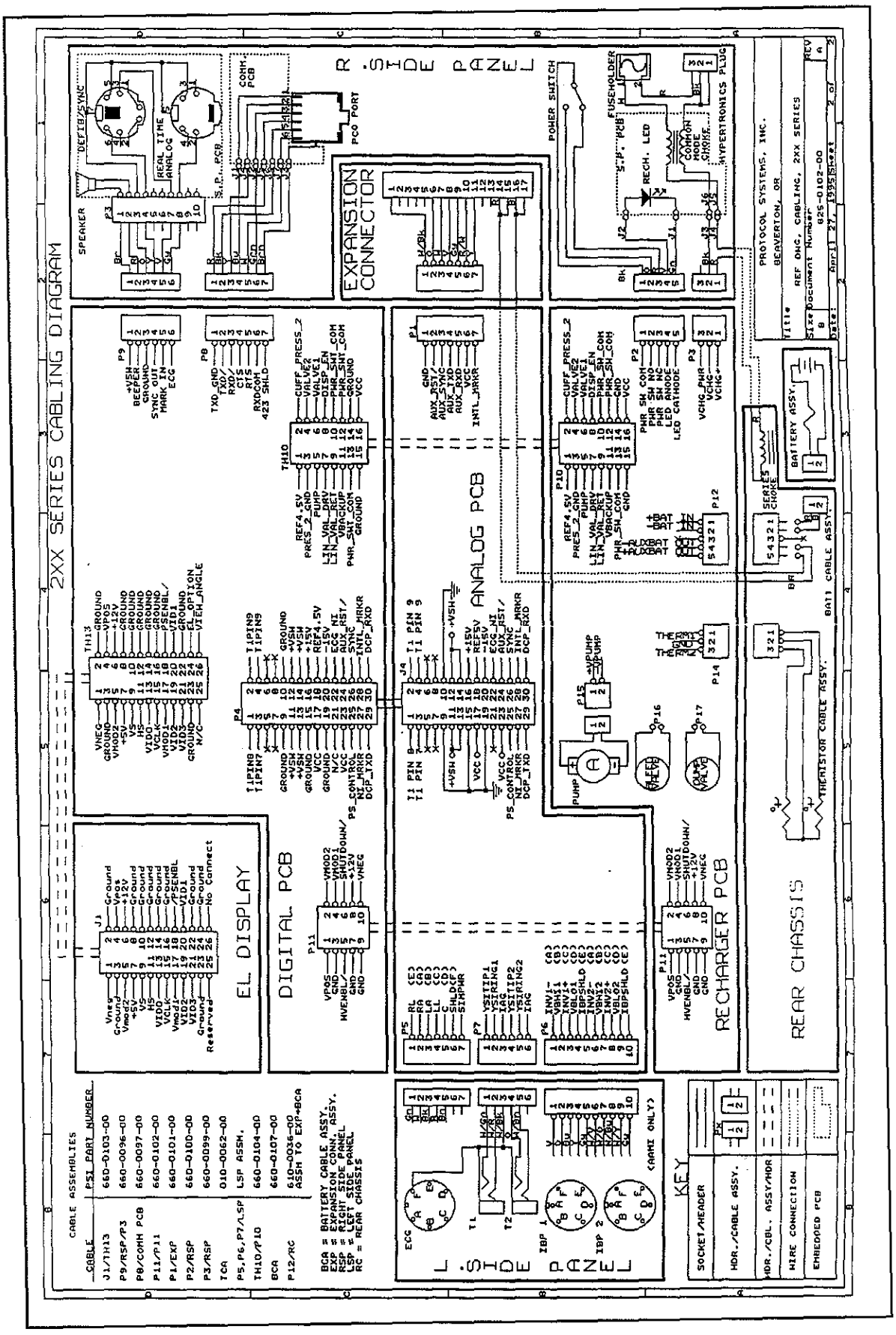

NIBP PNEUMATICS AT MAXIMUM TARGET PRESSURE
TO DAP A-D CONVERTER
PRIMARY TRANSDUCER
CUFF
SERVO (LINEAR) VALVE CLOSED
DUMP VALVE CLOSED
SECONDARY TRANSDUCER
PUMP OFF
BLEED VALVE OPEN
TO DCP A-D CONVERTER
ATMOSPHERIC PRESSURE
INCREASING PRESSURE (INFLATION)
DECREASING PRESSURE (DEFLATION)
PRESSURIZED (TARGET REACHED)
0696-64


NIBP PNEUMATICS DURING MEASUREMENT BLEED
TO DAP A-D CONVERTER
PRIMARY TRANSDUCER
CUFF
SERVO (LINEAR) VALVE OPEN
DUMP VALVE CLOSED
SECONDARY TRANSDUCER
PUMP OFF
BLEED VALVE OPEN
TO DCP A-D CONVERTER
ATMOSPHERIC PRESSURE
INCREASING PRESSURE (INFLATION)
DECREASING PRESSURE (DEFLATION)
PRESSURIZED (TARGET REACHED)
0696-65


NIBP PNEUMATICS AFTER MEASUREMENT COMPLETE
TO DAP A-D CONVERTER
PRIMARY TRANSDUCER
CUFF
SERVO (LINEAR) VALVE CLOSED*
DUMP VALVE OPEN
SECONDARY TRANSDUCER
PUMP OFF
BLEED VALVE OPEN
TO DCP A-D CONVERTER
ATMOSPHERIC PRESSURE
INCREASING PRESSURE (INFLATION)
DECREASING PRESSURE (DEFLATION)
PRESSURIZED (TARGET REACHED)
* VALVE IS INITIALLY CLOSED, BUT OPENS AFTER INITIAL DUMPING BEGINS BY DUMP VALVE. THIS CHECKS INTEGRITY OF DUMP VALVE'S ABILITY TO OPEN.
0696-66

Cabling Diagrams

The figure on page 6-15 shows the system cabling and routing for the monitoring system.


2XX SERIES CABLING DIAGRAM
CABLE ASSEMBLIES
CABLE
P/N PART NUMBER
J1/TH13 660-0103-00
P9/RSP/P3 660-0096-00
P8/COMM PCB 660-0097-00
P11/P11 660-0102-00
P1/EXP 660-0101-00
P2/RSP 660-0100-00
P3/RSP 660-0099-00
TCA 010-0062-00
P5,P6,P7/LSP LSP ASSM.
TH10/P10 660-0104-00
BCA 660-0107-00
P12/RC 610-0026-00 ASSM TO EXP+BCA
BCA = BATTERY CABLE ASSY.
EXP = EXPANSION CONN. ASSY.
RSP = RIGHT SIDE PANEL
LSP = LEFT SIDE PANEL
RC = REAR CHASSIS
EL DISPLAY
DIGITAL PCB
ANALOG PCB
RECHARGER PCB
REAR CHASSIS
L SIDE PANEL
R SIDE PANEL
EXPANSION CONNECTOR
POWER SWITCH
SPEAKER
DEFIB/SYNC
REAL TIME
ANALOG
PCO PORT
KEY
SOCKET/HEADER
HDR./CBL. ASSY/HDR
HDR./CBL. ASSY
WIRE CONNECTION
EMBEDDED PCB
PROTOCOL SYSTEMS, INC.
BEAVERTON, OR
REF ONC, CABLING, 2XX SERIES
Size B
Document Number 625-0102-00
Date: Apr 11 27, 1995
Sheet 2 of 3
REV A

Expansion Module and Printer Description

The printer shares battery power with the monitor, but contains its own power supply. The printer processor communicates with the monitor's processor through the expansion connector and cable.

The Expansion Module is designed to house the Propaq Encore Printer and other circuit boards for additional parameters. The main circuit board in the Printer is the Printer Main Board. An additional circuit board (key panel) in the expansion module with printer front chassis contains the push buttons.

The Printer Main Board is attached to the thermal printer mechanism and should be replaced as a unit with the printer mechanism if repair is needed.

The Printer Main Board connects to the expansion connector, the battery pack, the push buttons on the expansion module front panel, the printer mechanism (motor and print head), and the paper out and head up sensors.

The printer's microprocessor receives print data and control information from the Propaq Encore and sends data to the Encore. Communication between the two systems (Encore and printer CPUs) is done by sending and receiving data packets over serial communication lines.

The print head assembly contains 5 segments consisting of 64 thermal printing dots each for a total of 320 dots, which cover the width of the paper. As the paper moves under the print head, the system enables each segment energizing the thermal dots as necessary.

The Printer Main board consists of five functional blocks: Printer CPU, Printer Driver, Printer Logic, System Power, and Printer Power. These blocks are interconnected by several control lines and buses. External to the Printer Main board are the key panel, housed in the expansion module front chassis, and the printer motor and print head, both parts of the printer mechanism.

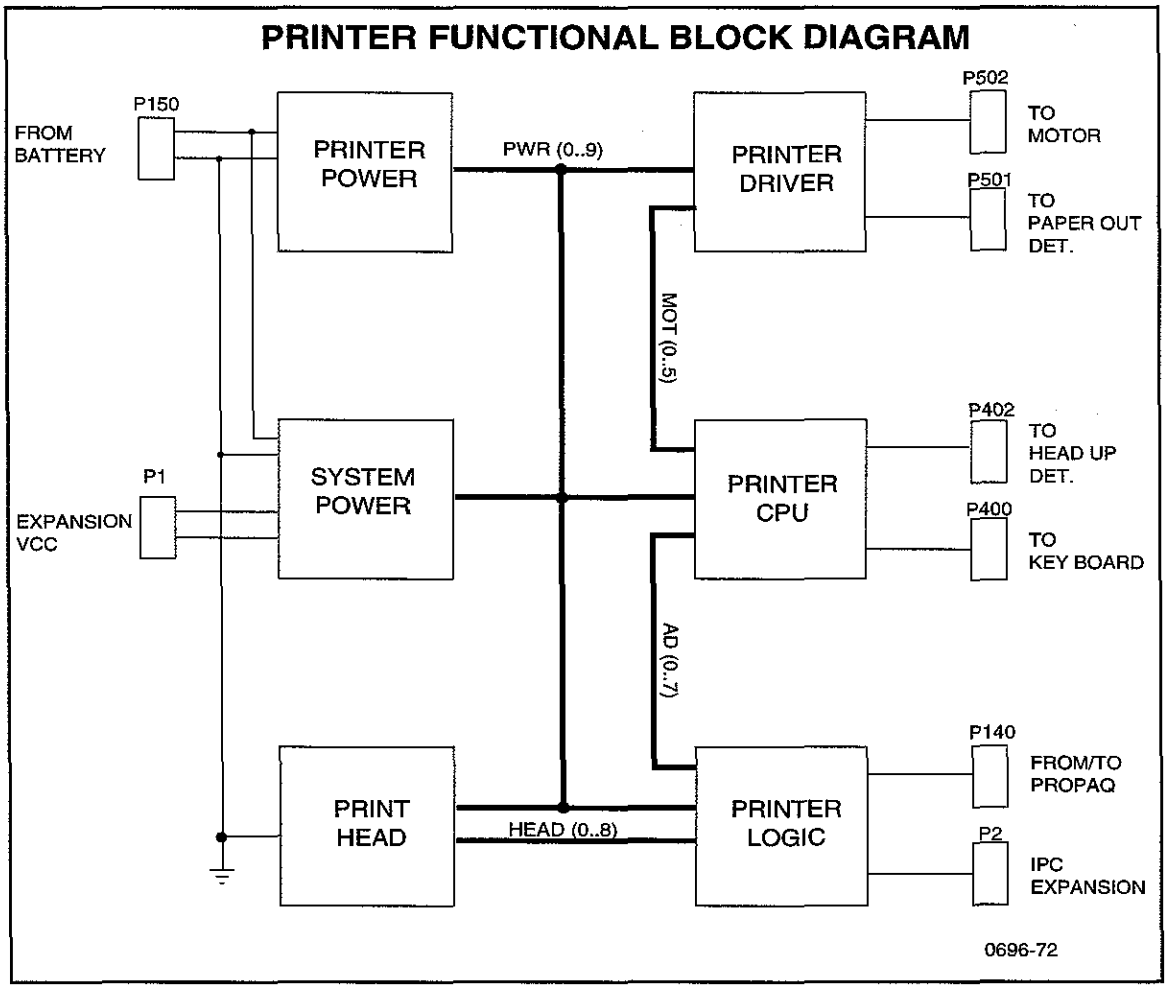
The Printer CPU block receives data and control information from the Propaq Encore through the Printer Logic block. The Printer CPU sends data to other printer circuits to control printer functions and sense printer conditions.

Throught the Printer Driver the CPU controls the stepper motor and detects when the paper has run out.

The CPU loads print data into the Printer Logic block and, through this block, controls the individual printhead segments. The CPU also interfaces with the Propaq Encore through this circuitry.

The System Power block provides several dc power supplies to the printer.

The Printer Power block provides the +24 V printer power supply.


PRINTER FUNCTIONAL BLOCK DIAGRAM
P150
FROM BATTERY
PRINTER POWER
PWR (0..9)
PRINTER DRIVER
P502
TO MOTOR
P501
TO PAPER OUT DET.
MOT (0..5)
P1
EXPANSION VCC
SYSTEM POWER
PRINTER CPU
P402
TO HEAD UP DET.
P400
TO KEY BOARD
AD (0..7)
PRINT HEAD
HEAD (0..8)
PRINTER LOGIC
P140
FROM/TO PROPAQ
P2
IPC EXPANSION
0696-72

Pulse Oximetry Option (SpO_2) Description

The Propaq Encore pulse oximetry option (SpO_2) hardware includes two circuit boards, a side-panel D connector, and related hardware. The pulse oximetry option is installed either in the pulse oximetry option module attached to the rear of the monitor or in the expansion module when the printer or the CO_2 options are also present.

The two circuit boards include the SpO_2 Communications Processor (SCP Board) and the SpO_2 Board. The SpO_2 Board provides all necessary circuitry to receive and process oxygen saturation data from the NELLCOR oxygen sensor. The SCP Board prepares the data for processing by the monitor's processor, and it handles all communications with the monitor. The SCP Board also drives the SpO_2 speaker.

The SpO_2 option hardware consists of the following items:

- monitor/option interface circuit board (SCP board)
- SpO_2 circuit board
- side-panel connector (9-pin D connector)
- SpO_2 speaker
- the SpO_2 case attached to the rear of the monitor when no expansion module option is also present
- in the case of the printer, the expansion module case attached to the bottom of the monitor

The SpO_2 signal provided by the oxygen transducer or sensor is first processed by the SpO_2 circuit board where it is converted to digital data, then that data is passed to the SCP board where it is prepared for transmission to the Propaq Encore monitor's main microprocessor.

An SpO_2 option isolated power supply, powered by monitor batteries, resides on the SCP board, supplying power to the SpO_2 circuits only. If the SpO_2 option is part of the expansion module, the SpO_2 power supply does not provide power to the printer in the expansion module. The printer circuit board provides power to the printer.

A connector on the side panel allows connection of an oxygen transducer (to the 9-pin D-type connector) directly to the Propaq Encore.

The NELLCOR oxygen transducer senses oxygen content of functional arteriolar hemoglobin through the use of light passed through the sensor site. The reflective/absorbative characteristics of hemoglobin at the wavelengths used allow the pulse oximetry circuits to obtain changing saturation levels, which can be processed to obtain the oxygen saturation percentage.

Wavelengths in the red and the infrared regions of light are produced by light emitting diodes (LEDs) manufactured to emit light at the required wavelengths. The reflected light is detected by a photo diode, which converts the light to an electrical signal. The LEDs are switched on and off under control of the SpO_2 microprocessor. Both are not on at the same time. As the system receives the signal from the photo diode, it knows whether the signal was derived from the red or infrared LED. Because the photo diode is sensitive to light emitted from sources other than the LEDs (ambient light), an ambient light component is subtracted from the signal during the processing of the SpO_2 data.

An internal calibration resistor in the transducer is used to identify the wavelengths of light produced by the LEDs. This information is required for proper processing of the SpO_2 data.

The oxygen transducers are not serviceable units.

The figure on page 6-20 shows a functional block diagram of the SpO_2 circuit board. The SpO_2 board consists of the following subsystems:

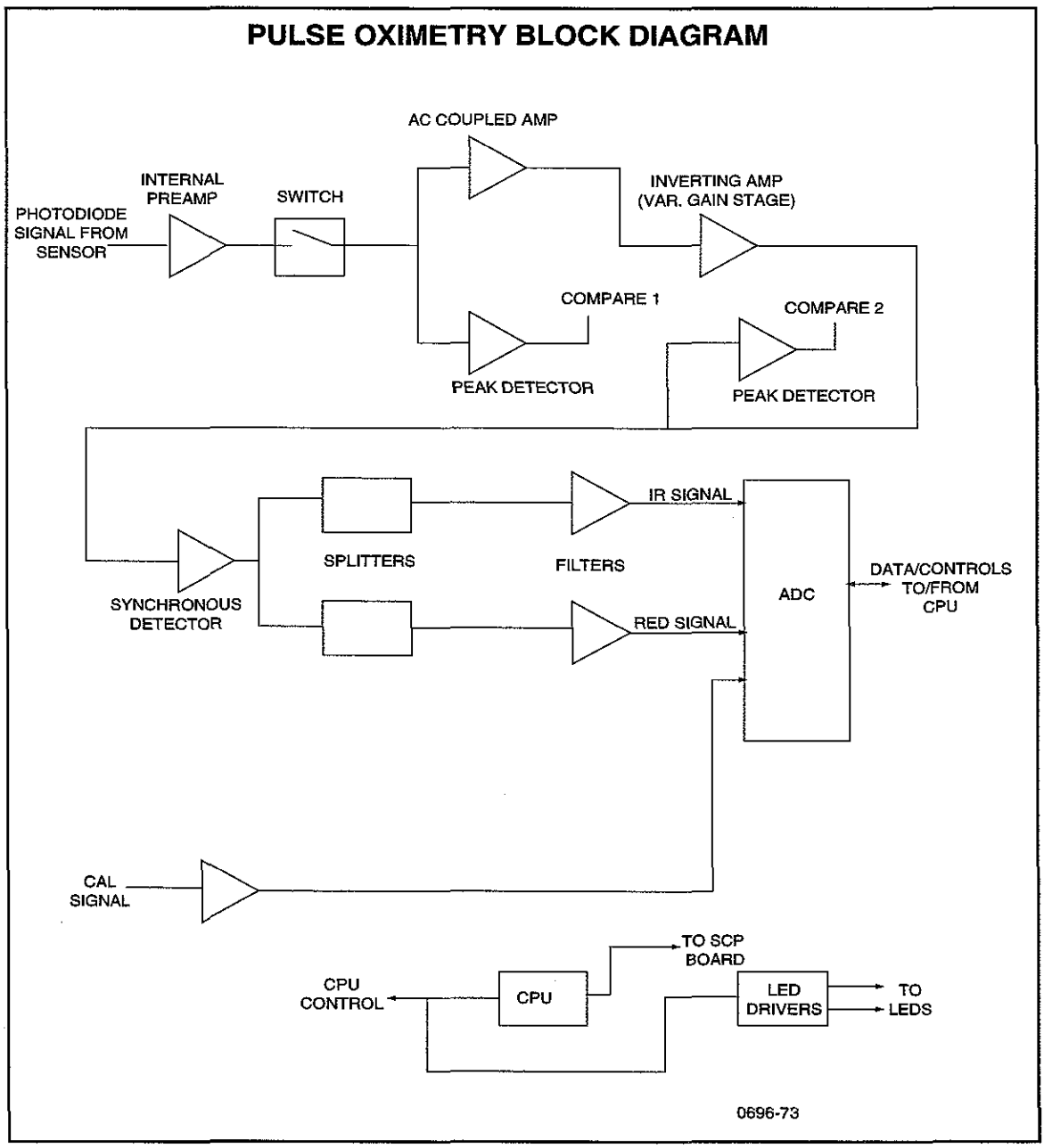
- internal preamplifier and switch
- ac-coupled amplifier
- inverting amplifier with variable gain stage
- synchronous detector
- splitter
- 5-pole low pass filters
- 16-bit ADC
- internal calibration amplifier
- CPU/Control
- LED current drivers
- compare amplifiers

The CPU detects the presence of a transducer plugged into the D-type connector. Switch S1 routes the signal from the preamplifier to the ac-coupled amplifier. The input signal is ac-coupled to remove any dc offset present. The result is a pulse waveform representing light levels from three sources: red LED, infrared (IR) LED, and ambient. An inverting amplifier with a variable gain stage scales the signal to allow processing the best available pulse oximetry information.

Because the CPU controls the LEDS in the sensor, it knows which pulse level of the input waveform represents which wavelength of light. When the red LED is activated, the waveform level indicates red light plus ambient light. When the IR LED is activated, the waveform level indicates IR light plus ambient light. When neither LED is activated, the waveform level indicates ambient light. Only the detected red and IR light levels are used to determine the SpO_2 saturation value. The synchronous detector inverts the ambient light signal so that the ambient light signal can be subtracted from the red plus ambient light signal and the IR plus ambient light signal.

The pulses are filtered through 5-pole filter networks to remove the signal components above about 20 Hz. The resulting signals indicate the detected RED and IR light levels and can then be digitized. The data from the ADC is processed by the CPU and then sent to the SCP board for transmission to the Propaq Encore monitor's CPU.

SpO_2 signal level is controlled through the variable gain stage of the inverting amplifier and the output current of the LED current driver. By controlling both signal gain and current drive, the CPU can maintain the best possible signal level for processing. Amplifiers sense the SpO_2 signal levels at two points, directly sending their outputs to the CPU. The CPU monitors these levels as it sets the gain stages of the inverting amplifier and LED current driver.


PULSE OXIMETRY BLOCK DIAGRAM
AC COUPLED AMP
INTERNAL PREAMP
SWITCH
PHOTODIODE SIGNAL FROM SENSOR
INVERTING AMP (VAR. GAIN STAGE)
COMPARE 1
COMPARE 2
PEAK DETECTOR
PEAK DETECTOR
IR SIGNAL
SPLITTERS
FILTERS
ADC
DATA/CONTROLS TO/FROM CPU
SYNCHRONOUS DETECTOR
RED SIGNAL
CAL SIGNAL
TO SCP BOARD
CPU CONTROL
CPU
LED DRIVERS
TO LEDS
0696-73

Capnography (CO_2) Description

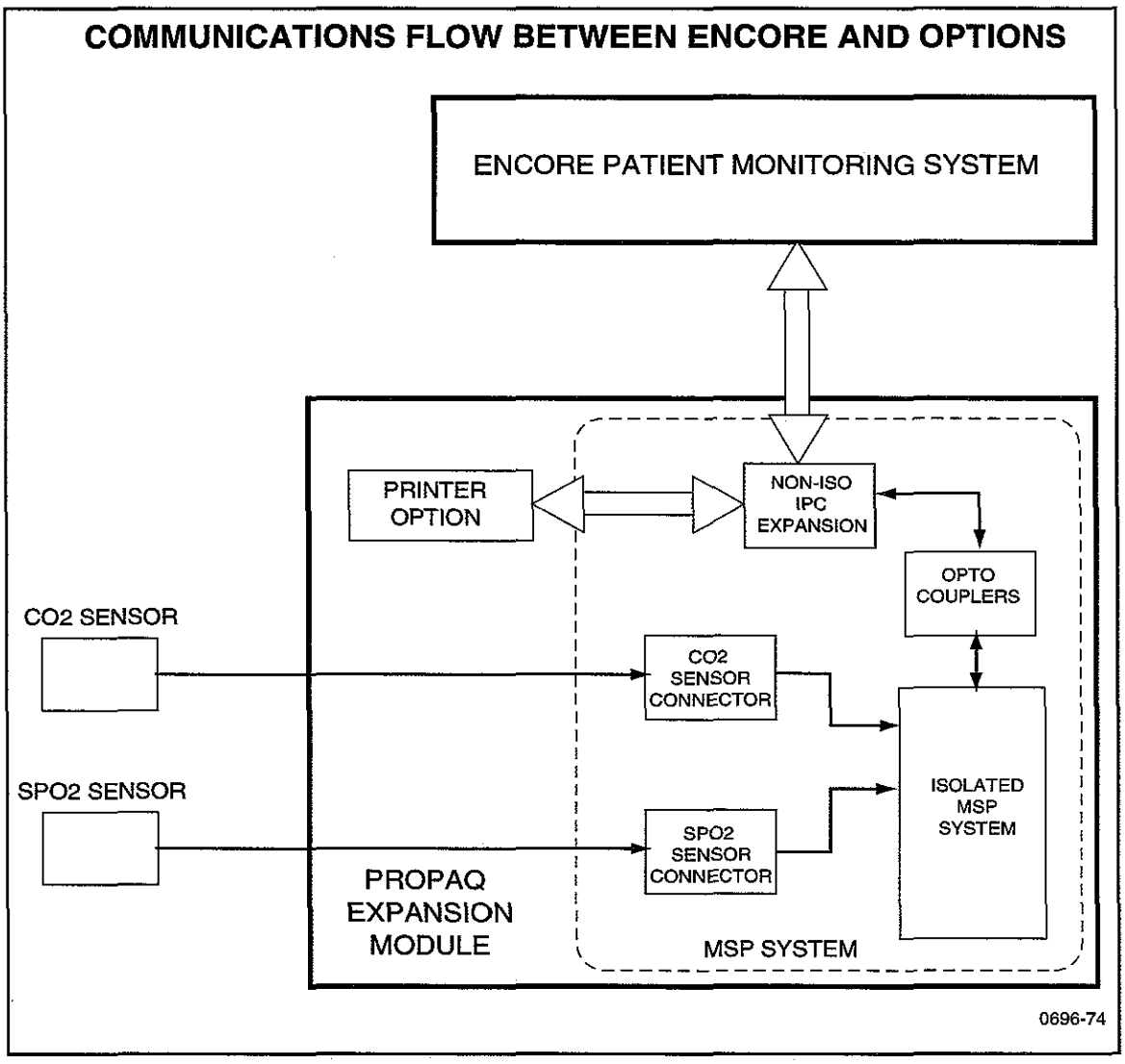
The Propaq Encore Capnography (CO_2) Option includes a CO_2 circuit board, a Nicolay connector and related hardware. The CO_2 circuit board is mounted on the inside back of the expansion module. A portion of the CO_2 circuit board eliminates the need for the SpO_2 option SCP board when that option also is installed.

The Main Stream Processor circuit board (MSP board) is the major interface connection between several subsystems in the Expansion Module. This circuit board connects directly to the expansion connector, providing a direct interface to a Propaq Encore Display Processor system.

The MSP board also supports:

- Main Stream CO_2
- an interface to the SpO_2 system
- an interface to the Printer option

The figure on page 6-22 shows the primary information flow between major blocks within the Propaq Encore monitor system and the Expansion Module Options.


COMMUNICATIONS FLOW BETWEEN ENCORE AND OPTIONS
ENCORE PATIENT MONITORING SYSTEM
PRINTER OPTION
NON-ISO IPC EXPANSION
OPTO COUPLERS
CO2 SENSOR
CO2 SENSOR CONNECTOR
SPO2 SENSOR
SPO2 SENSOR CONNECTOR
ISOLATED MSP SYSTEM
PROPAQ EXPANSION MODULE
MSP SYSTEM
0696-74

Mainstream Board

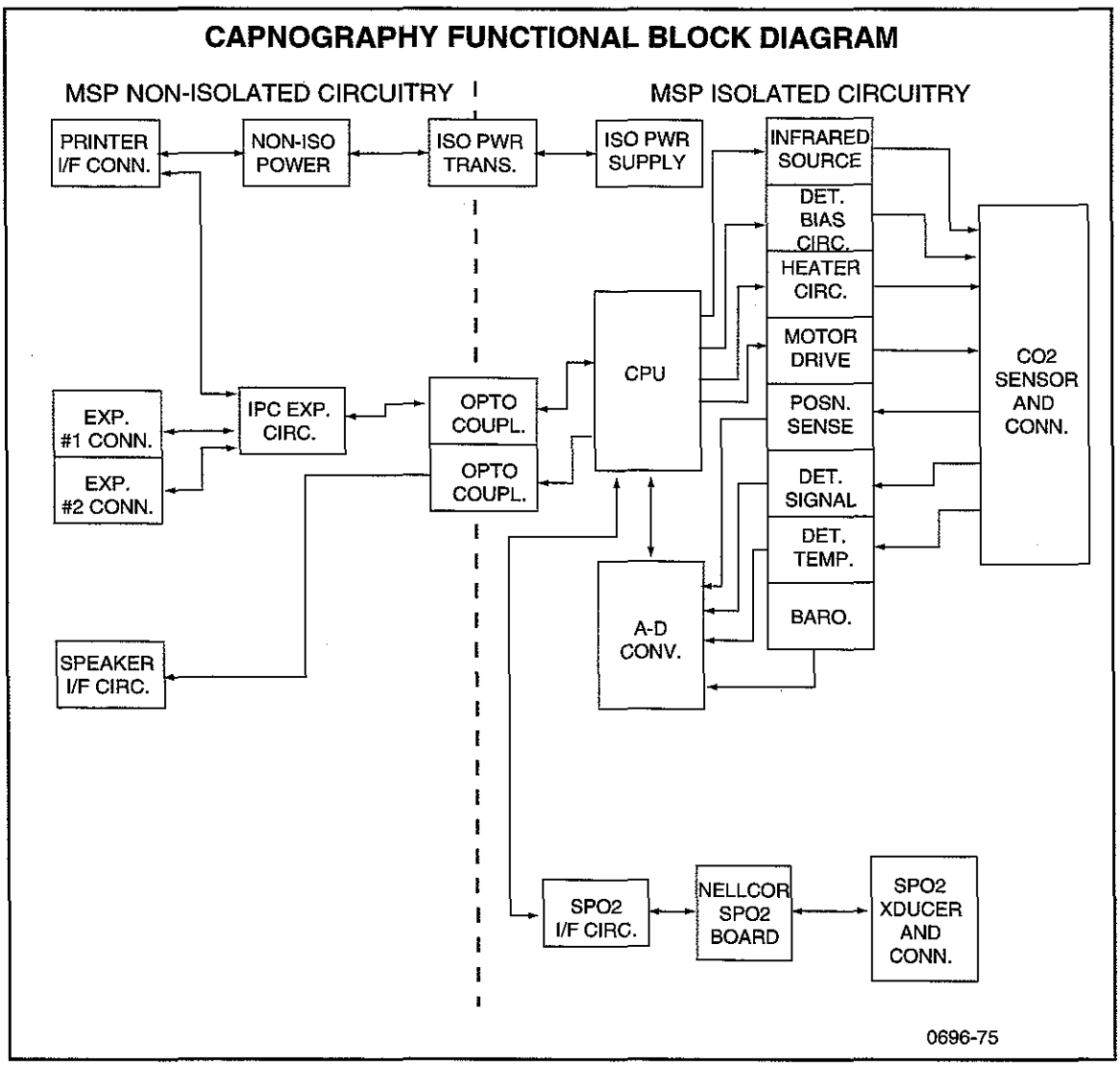
The MSP board is divided into isolated and non-isolated circuitry. See the figure below.

Non Isolated Circuitry. The Non-Isolated circuitry on the MSP board interfaces with the Propaq Encore, the printer, the speaker, and with the Main Stream Processor which resides on the isolated section of the MSP board.

Isolated Circuitry. The Isolated Circuitry directly controls the hardware responsible for the CO_2 measurement function.

A UART directly interfaces with the Nellcor SpO_2 board providing the SpO_2 measurement function.

The CO_2 and SpO_2 functions are isolated from all other subsystems in the Propaq Encore or Expansion modules, but not from each other.



IPC Expansion

The Inter-processor Communications (IPC) bus, originating in the Propaq Encore, is passed to the MSP board from the expansion connector. The two-wire bus is expanded to the printer and to the Main Stream Processor via opto-couplers.

Power Distribution System

Power for CO_2 and SpO_2 circuit operations is derived solely from the expansion Connector. The principal supply comes from the Propaq Encore battery connections and an on-board switching power supply.

Main Stream CO_2 Sensor

The Propaq Encore monitor performs CO_2 monitoring using infrared (IR) measurements obtained from a mainstream CO_2 sensor. The sensor is incorporated into the airway close to the patient's mouth, usually between the endotracheal tube and the gas-delivery apparatus.

The CO_2 sensor consists of a light source and filter, a revolving chopper wheel, and a photodetector.

The chopper wheel contains a sealed CO_2 reference cell and an open slot, arranged in a flat, circular, aluminum base.

The sensor mounts over and connects to a disposable airway adapter through which the patient's gases flow.

An IR beam at one end of the sensor is projected through the patient's airway gases to a photodetector at the other end of the sensor. On its way to the photodetector through the airway gases, the IR beam also passes through either the open slot or the sealed CO_2 reference cell on the chopper wheel.

The chopper wheel revolves every 30 milliseconds, generating two absorption-level measurements: 1) when the light passes through the opening as well as the airway gas, and 2) when the light passes through the sealed CO_2 cell as well as the airway gas.

The photodetector transforms these two measurements into numerical values which the Propaq Encore system uses to calculate CO_2 concentration in each exhaled breath. The result is translated into voltage and sent to the real-time graphical display, where it is shown as an analog waveform.

The system compensates for the presence of varying and unpredictable contaminants such as moisture or mucus by using a ratiometric technique. The system also compensates automatically for changes in barometric pressure. Warm-up time is less than 20 seconds, and sensor temperature is maintained at a level sufficient to reduce condensation.

Section 7
Field Replaceable Units (FRUs)

List of FRUs

The following list identifies the available FRUs for the Propaq Encore. To order an FRU, contact Protocol Systems Technical Support as described in Section 1.

SERVICE KIT DESCRIPTION	PROTOCOL PART NO.
MONITOR CIRCUIT BOARD ASSEMBLIES	
ANALOG PCB	020-0504-00
DIGITAL PCB	020-0505-00
RECHARGER PCB, EL	020-0506-00
DISPLAY MODULE, EL	020-0507-00
MONITOR FRONT/REAR CHASSIS PARTS	
FRONT CHASSIS	020-0508-00
CAP, VERTICAL KEY	630-0093-00
CAP, HORIZONTAL KEY	630-0087-00
KEY PAD, ELASTOMERIC	630-0086-00
REAR CHASSIS ASSY.	020-0511-00
MONITOR SIDE PANELS (LABELS NOT INCLUDED)	
LEFT SIDE PANEL, AAMI CONNECTORS	020-0509-00
LEFT SIDE PANEL, HP CONNECTORS	020-0510-00
RIGHT SIDE PANEL	020-0511-00
NIBP SYSTEM PARTS	
PUMP	680-0051-00
NIBP PLUMBING, AAMI CONNECTORS	020-0513-00
NIBP PLUMBING, HP CONNECTORS	020-0514-00
CONNECTOR PAIR, CUFF HOSE, QUICK DISCONNECT	020-0065-00
CONNECTOR, CUFF HOSE, PROPAQ ENCORE END	010-0152-00
VALVE, OVER-PRESSURE	600-0145-00

SERVICE KIT DESCRIPTION	PROTOCOL PART NO.
RELEASE VALVE	680-0049-00
OVER-PRESSURE BLEED	680-0050-01
INTERNAL TUBING, SILICONE, 2 FEET, 0.104"ID	008-0009-00
INTERNAL TUBING, SILICONE, 1 FOOT, 0.125"ID	600-0179-00
MISC. COMPONENTS FOR MONITOR	
FUSES, 2AG-3A, SLO-BLO	503-0058-00
FUSE KIT, 3A PICO FUSE, 125 V, QTY. 10	020-0210-00
FUSE, 120 V POWER ADAPTER	503-0057-00
FUSE, 220 V POWER ADAPTER	503-0056-00
SWITCH, ON/OFF, POWER, W/O BOOT SEAL	680-0010-01
BOOT SEAL, POWER SWITCH	680-0006-00
FOOT PADS	020-0033-00
HANDLE	010-0163-00
CABLE ASSY., 10-PIN RIBBON, DIGITAL TO RECH. PCB	660-0102-00
EXPANSION MODULE/PRINTER OPTION	
PRINTER ASSEMBLY	020-0516-00
EXPANSION MODULE CHASSIS, WITH PRINTER	020-0520-00
EXPANSION MODULE CHASSIS, WITHOUT PRINTER	020-0521-00
FRONT PANEL	020-0515-00
REAR PANEL	020-0071-00
PAPER DOOR (LABEL NOT INCL.)	020-0074-00
CAP, HORIZONTAL KEY	630-0087-00
KEY PAD, ELASTOMERIC	630-0086-00
FUSE, 15A PICO, 125 VOLT, ONE EACH	503-0019-00
PULSE OXIMETER OPTION	
MINISOOM BOARD	020-0473-00
SCP BOARD	020-0476-00
OXIMETER CHASSIS for PROPAQ ENCORE MOUNTING	020-0122-00
OXIMETER REAR PANEL for PROPAQ ENCORE MOUNTING	020-0123-00
MOUNTING SCREWS/WASHERS	020-0126-00
SPEAKER PANEL ASSEMBLY	010-0161-00

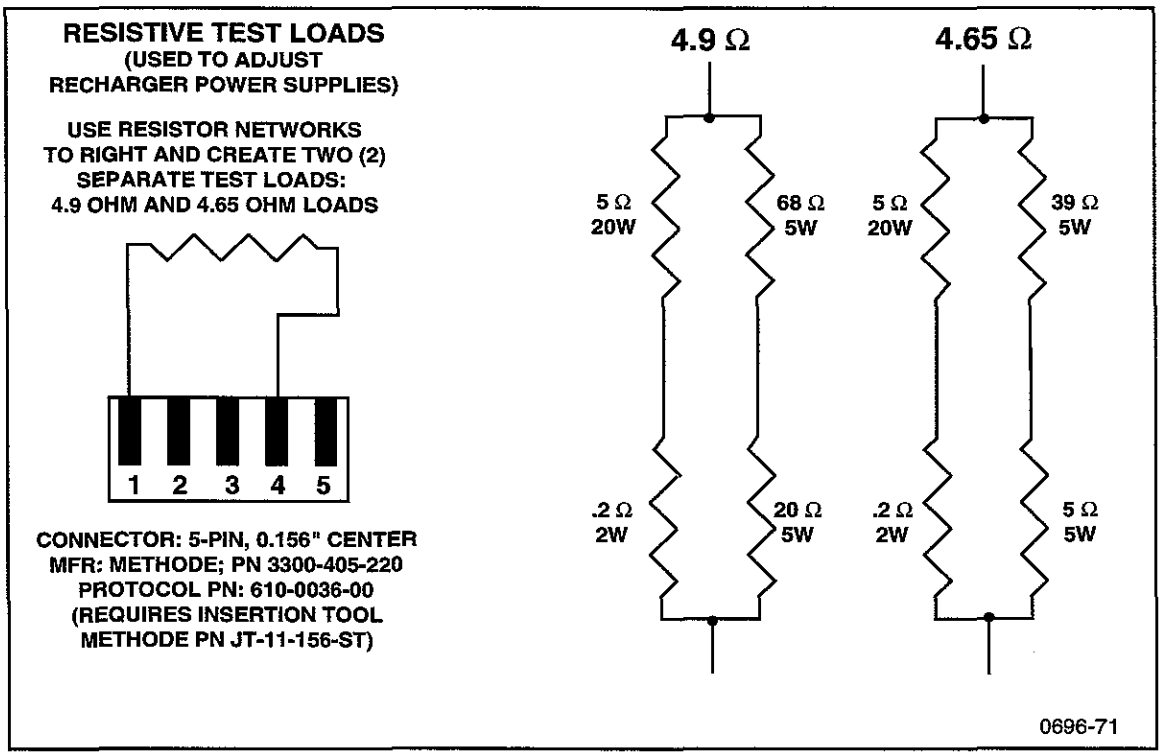
SERVICE KIT DESCRIPTION	PROTOCOL PART NO.
CONNECTOR PANEL ASSY. (LOCKING RING NOT INCLUDED)	010-0159-00
LOCKING RING, D CONNECTOR	630-0038-00
$ETCO_2$ OPTION	
PCB ASSEMBLY, MSP BOARD	020-0286-50
CONNECTOR PANEL, CO_2 (W/LABEL)	020-0285-00
OPTION INTERCONNECT CABLES	
CABLE ASSY., POWER HARNESS, EM	660-0090-00
CABLE ASSY., PROPAQ ENCORE P4 TO PCP-P140	010-0055-00
CABLE ASSY., PROPAQ ENCORE P4 TO SCP/MSP-P1	010-0048-00
CABLE ASSY., SCP-P4 TO PCP-P140 / KEYPAD TO PCP-P400	010-0054-00
CABLE ASSY., MSP-P4 TO PCP-P140	010-0056-00
LABELS, ALL LANGUAGE APPLICATIONS	
LABEL, LOGO, PROPAQ ENCORE	640-0330-03
LABEL, MODEL 202EL	640-0350-00
LABEL, MODEL 204EL	640-0349-00
LABEL, MODEL 206EL	640-0348-00
LABEL, RIGHT SIDE PANEL	640-0325-00
LABEL, RIGHT SIDE PANEL, COMM.	640-0326-00
LABEL, LEFT SIDE PANEL, 202, AAMI, UNIVERSAL	640-0321-00
LABEL, LEFT SIDE PANEL, 202, HP, UNIVERSAL	640-0356-00
LABEL, LEFT SIDE PANEL, 202/RESP., AAMI, UNIVERSAL	640-0329-00
LABEL, LEFT SIDE PANEL, 202/RESP., HP, UNIVERSAL	640-0355-00
LABEL, LEFT SIDE PANEL, 204, AAMI, UNIVERSAL	640-0320-00
LABEL, LEFT SIDE PANEL, 204, HP, UNIVERSAL	640-0354-00
LABEL, LEFT SIDE PANEL, 204/RESP., AAMI, UNIVERSAL	640-0328-00
LABEL, LEFT SIDE PANEL, 204/RESP., HP, UNIVERSAL	640-0353-00
LABEL, LEFT SIDE PANEL, 206, AAMI, UNIVERSAL	640-0319-00
LABEL, LEFT SIDE PANEL, 206, HP, UNIVERSAL	640-0352-00
LABEL, LEFT SIDE PANEL, 206/RESP., AAMI, UNIVERSAL	640-0327-00
LABEL, LEFT SIDE PANEL, 206/RESP., HP, UNIVERSAL	640-0351-00
LABEL, SpO_2 CONNECTOR PANEL	640-0312-00

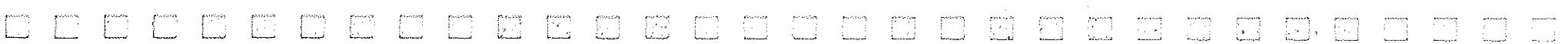
SERVICE KIT DESCRIPTION	PROTOCOL PART NO.
LABEL, SpO_2 REAR PANEL	640-0331-01
LABEL, CONNECTOR PANEL, CO_2	640-0314-00
LABELS, ENGLISH APPLICATIONS	
LABEL, LEFT KEYS/ALARM LEDS	640-0286-00
LABEL, RIGHT KEYS	640-0285-00
LABEL, LEFT SIDE PANEL, 202, ADULT/PED., AAMI, INTERIM U.S.	640-0367-00
LABEL, LEFT SIDE PANEL, 202, ADULT/PED., HP, INTERIM U.S.	640-0366-00
LABEL, LEFT SIDE PANEL, 204, ADULT/PED., AAMI, INTERIM U.S.	640-0368-00
LABEL, LEFT SIDE PANEL, 204, ADULT/PED., HP, INTERIM U.S.	640-0365-00
LABEL, LEFT SIDE PANEL, 206, ADULT/PED., AAMI, INTERIM U.S.	640-0369-00
LABEL, LEFT SIDE PANEL, 206, ADULT/PED., HP, INTERIM U.S.	640-0364-00
LABEL, PRINTER, KEY PANEL	640-0332-00
LABELS, FRENCH APPLICATIONS	
LABEL, LEFT KEYS/ALARM LEDS, FRENCH	640-0378-00
LABEL, RIGHT KEYS, FRENCH	640-0375-00
LABEL, PRINTER, KEY PANEL, FRENCH	640-0372-00
LABELS, GERMAN APPLICATIONS	
LABEL, LEFT KEYS/ALARM LEDS, GERMAN	640-0379-00
LABEL, RIGHT KEYS, GERMAN	640-0376-00
LABEL, PRINTER, KEY PANEL, GERMAN	640-0373-00
LABELS, SPANISH APPLICATIONS	
LABEL, LEFT KEYS/ALARM LEDS, SPANISH	640-0377-00
LABEL, RIGHT KEYS, SPANISH	640-0374-00
LABEL, PRINTER, KEY PANEL, SPANISH	640-0371-00
SERVICE TOOLS	
EXTENDER CABLE, EXPANSION MODULE POWER	850-0409-00
NIBP CALIBRATION SETUP TUBING ADAPTER KIT	008-0012-00

Appendix A
Manufacturable Test Equipment

Introduction

The following device(s) can be manufactured for use in the functional verification and calibration procedures in this manual. Parts are readily available from electronic component suppliers.



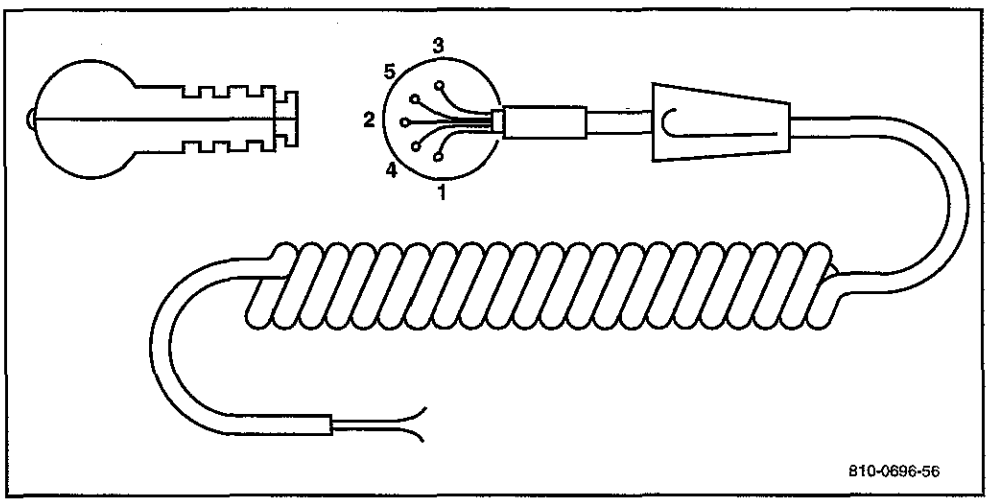


Appendix B Dynatech/Nevada Patient Simulator Modification

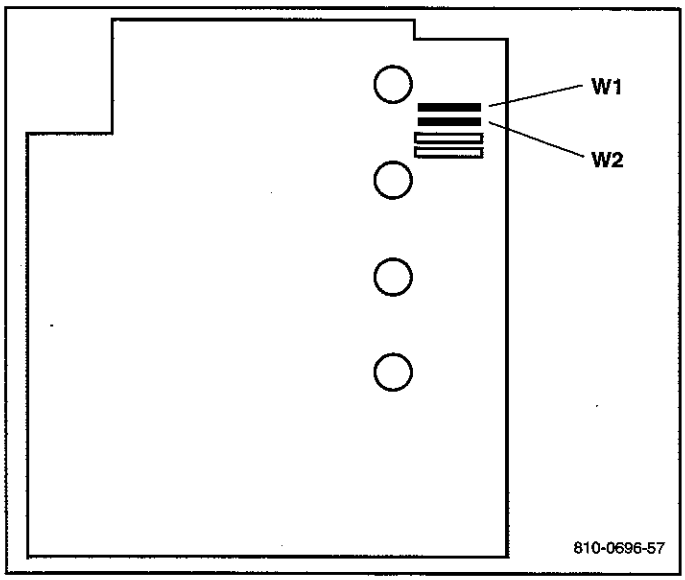
Introduction

The factory configuration of the Dynatech/Nevada model 214A, 215A, and 217A Patient Simulators is incompatible with the Propaq Encore monitors with IBP channels when both the ECG and invasive pressure simulator channels are simultaneously connected to the monitor. Erroneous readings result. The patient simulator must be modified as described in this appendix in order to use both simulator channels with the Propaq Encore monitors with IBP. If only one simulator channel is used, the modification is unnecessary.

Modify the patient simulator's invasive pressure cable as shown in the figure below.



Remove jumpers W1 and W2 from the patient simulator's Top PCB.



Incompatibilities with other simulators may also cause erroneous readings and/or missing ECG. Check Propaq Encore readings with the simulator against a known source before using the simulator for calibration.

Function	Color	Pin No.	Encore 204/206
Output (+)	Black	4	C
Output (-)	Red	1	A & E
Exciter (+)	White	3	B
Exciter (-)	Green	5	D
ECG Ref	Blue	2	No Connection